Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

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Fig. 1.—60-cycle, 250-hp., 700-r.p.m., 440-volt Driving Williams Mill, in Plant of Southwestern Portland Cement Co.

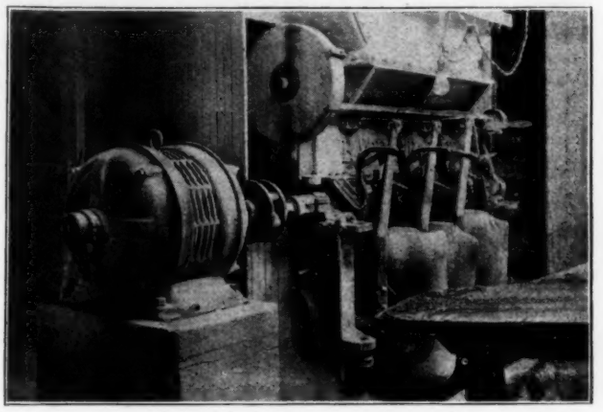

Fig. 2.—15-hp., 1140-r.p.m. Westinghouse Motor Driving Sacking Machine.

Electric Drive in California Cement Mill

Motor-Driven Machinery Proves Successful in Plant of Southwestern Portland Cement Co. at Victorville, Cal. —Central-Station Service Used — Description of Process

APPLICATION of electric drive in the operation of a cement mill, and the advantages to be derived therefrom, are unusually well exemplified in the plant of the Southwestern Portland Cement Co. at Victorville, Calif. This town is in the southwestern part of the state, about 100 miles from Los Angeles on the Santa Fe Railroad, the tracks of which pass by the plant, affording a convenient outlet for the finished product.

This mill has an output of 300,000 bbls. a year of portland cement, and employs approximately 80 people. All of the buildings are of substantial concrete construction built to withstand the severe conditions imposed by the heavy machinery installed.

Water for the wet process system of manufacture, and for use throughout the mill, is raised to a reservoir on a hill back of the plant by a 15-hp. motor-driven triplex pump. Rock and shale are brought to the mill from the quarry which is located 7 miles distant, by a steam locomotive hauling trains of cars that have two compartments or hoppers which are dumped one at a time into the crusher.

Electric current is purchased from the Southern Sierras Power Co., thus relieving the company of the expense and trouble incident to the operation of a power plant. Current is received at 33,000 volts and stepped down to 440 volts, for application to the various motors installed throughout the mill.

Transformers and switching apparatus are of the outdoor type, located immediately adjacent to the mill. The current is taken from here to a 7-panel marble switchboard, built by the Westinghouse Electric & Manufacturing Co., from which it is distributed to the various power and lighting circuits in the mill.

Lime rock is delivered from the hopper cars direct to the crusher, but a reserve pile of crushed stone, amounting to between 3000 and 5000 tons, is maintained sufficient to keep the mill operating for a period of approximately 30 days. This reserve is maintained in the event of any accident, such as a washout, crippling the railroad service from the quarry to the mill.

The crusher and Williams mill are driven by a 250-hp. Westinghouse type CW wound-rotor type motor—as shown in Fig. 1—which break the rock into pieces about the size of a walnut or a little larger. From here the rock is elevated to a storage bin by a bucket elevator, driven by a 30-hp. motor, and thence by belt conveyor to the pulverizing house. Up to this time no water has been put with the rock except what is thrown on at the time it goes into the crusher, which is done with a hose to eliminate whatever dust rises during that process.

During the process of pulverization, water is added again for the purpose of eliminating the dust. After being thoroughly pulverized, the mixture is taken to the slurry tanks where it is kept in motion by air agitation until ready for admission to the kiln.

There are six slurry tanks served in pairs by ele-

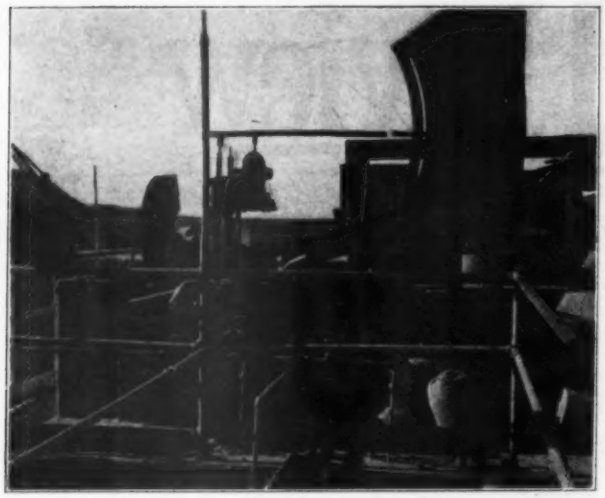

Fig. 3.—¼-hp., 440-volt., 1725-r.p.m. Westinghouse Single-Phase Motor Driving Slurry Feed Control Dipper.

vators operating at a speed of approximately 88 ft. per min., for elevating the mixture from the pulverizing house tanks, and driven by a 7½-hp., constant-speed motor.

After the mixture has been thoroughly agitated it is transferred to the slurry tanks nearest the kiln. From here it flows into a sump and is delivered to the kiln by a motor-operated measuring device illustrated in Fig. 3, which shows the rear of the scale. The dipper is made in the shape of an S, the outlet being in the center. By raising and lowering the dipper in the sump the amount of slurry entering the kiln can be controlled. The dipper is driven by an extended shaft, provided with two universal joints from one of the elevators, and is raised and lowered by a ¼-hp. 1725-r.p.m. motor by means of remote control from the clinker end of the kiln. The large scale is visible to the operator at the clinker end and he can feed the proper amount of mixture to the kiln and watch his fire at the same time.

The rotary kiln is approximately 200 ft. long and 20 ft. diam., lined with fire brick and heated by an oil burner to a temperature of about 2500°, which is measured by a radiation pyrometer. It is driven at a speed of 1 r.p.m. by a 50-hp., type CW, 700-r.p.m.

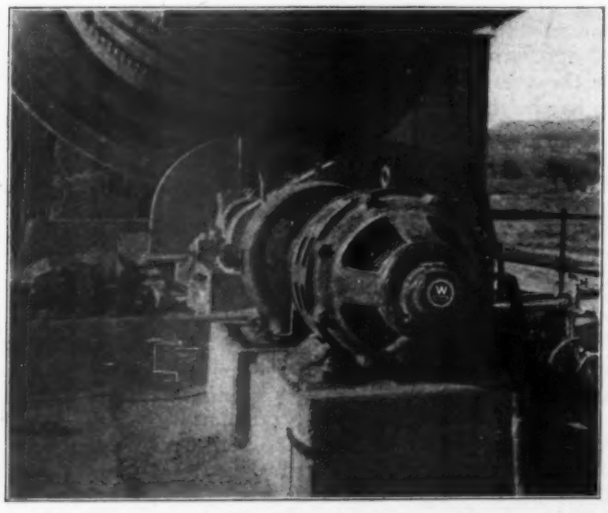

Fig. 4.—50-hp., 440-volt, 60-cycle, 3-phase, 700-r.p.m. Motor Driving Rotary Kiln Through Foote 14 to 1 Reducer; Speed, 1 r.p.m.; Double Reduction, 48 to 1.

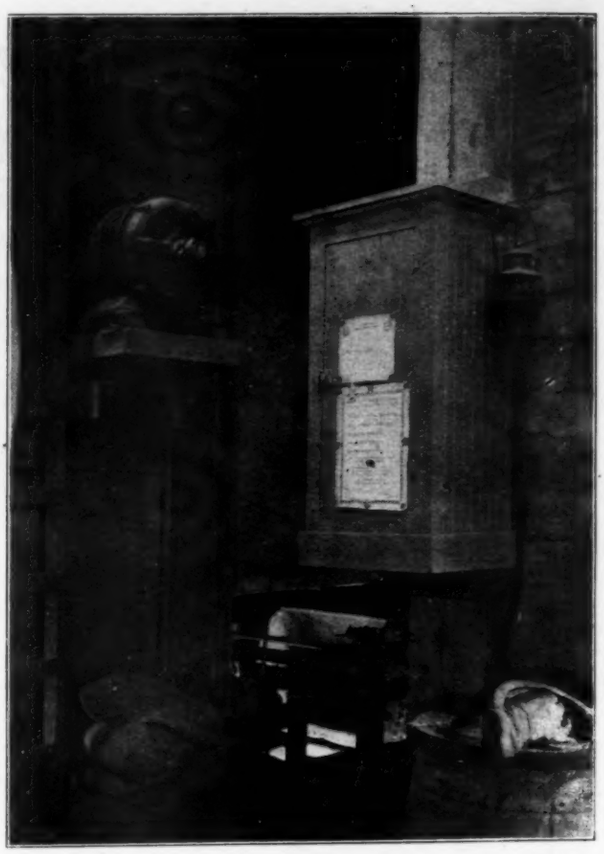

Fig. 5.—7½-hp., 680-r.p.m., 440-volt, 60-cycle Motor Driving Clinker Elevator.

motor through Foote reduction gears, as shown in Fig. 4. The kiln is elevated at the raw end so that, as it rotates, the mixture will travel toward the clinker end. Upon coming from the kiln the clinker falls about 20 ft. into a pit to allow it to cool somewhat. It is then elevated by the clinker elevator which is driven by the 7½-hp., 680-r.p.m. motor, shown in Fig. 5, to an automatic scale and dumped into the storage bin. From the storage bin the clinker is transferred by means of a locomotive crane, with a clamshell bucket, to a bin from which it is fed into the finish mill. The locomotive crane is also used for mixing the clinker, as it will vary somewhat in quality. After being ground and analyzed by the chemical department, it is ready for the packing house, to which it is carried on a belt conveyor over a weighing machine, which automatically records the number of barrels that pass.

From the storage bins, the cement is taken to the

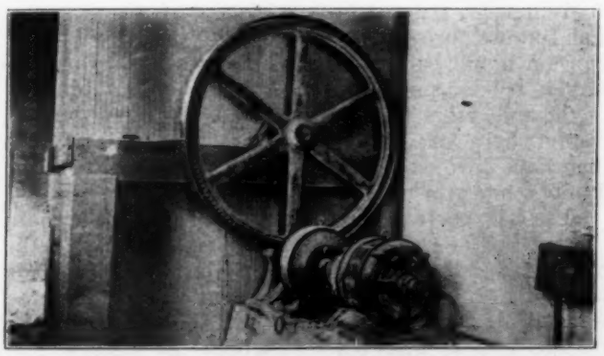

Fig. 6.—7½-hp., 10-pole, 680-r.p.m. Westinghouse Motor Driving Sack Cleaner Through Foote Reducer.

sacking machines, shown in Fig. 2, driven by a 15-hp. motor. A sack cleaner driven by a 7½-hp., 680-r.p.m. motor, through a Foote reduction gear, is shown in Fig. 6. A 15-hp. motor-driven blower, for collecting dust from the sacking and sack cleaning machines, is also used.

The motors are of the 440-volt, 60-cycle, 3-phase, induction type, and were furnished by the Westinghouse Electric & Manufacturing Co., of East Pittsburgh.

This plant was designed and built by L. D. Gilbert, and has been in operation over 3 years, during which time no shutdowns have been experienced due to any trouble with the electrical equipment. It is a model plant from every standpoint and is practically dustless.

UNIQUE NATIONAL ADVERTISING EXHIBIT PLANNED AT NEW ORLEANS.

Successful National Advertising Campaigns, Industrial Relations Campaign and the Neosho Co-operative Advertising Plan to Be Featured.

Information of a most valuable character will be available to those who visit the National Advertising Exhibit, to be held as a part of the 15th annual convention of the Associated Advertising Clubs of the World, at New Orleans, La., Sept. 21 to 25, says a recent bulletin from the advertising association. It is believed that this exhibit will prove of interest to electrical manufacturers, jobbers and utility companies that do extensive advertising.

In addition to the fact that this year's advertising exhibit will take a new form, embracing complete showings of several actual advertising campaigns, it is also announced that at stated hours those who planned and executed the campaigns shown will be on hand to explain them and to answer any questions which are not answered to the complete satisfaction of the visitor by the exhibits themselves.

Several campaigns are to be shown; there will be national, semi-national, territorial and local campaigns. Advertisements from publications and from all other mediums used, as well as "follow-up" matter employed in the campaigns will be shown and explained, and Joseph S. Potsdamer, of Philadelphia, chairman of the exhibit committee, has declared that it will be such an exhibit and explained in such interesting detail, as to bring notebooks from the pockets of those who see it.

In addition to these campaigns, two other features of importance are being planned. One of them, following the chief theme of the convention, will show campaigns which have been used by manufacturers, merchandising establishments and other employers, in gaining the co-operation of their employes. This section will be supplemental to the plan to have a labor leader and a man equally representative of capital present what they believe to be the terms upon which capital and labor can agree so as to insure increased production and thereby insure continued prosperity. Samuel Gompers, president of the American Federation of Labor, has accepted a place on the program.

The other feature of importance will be a complete exhibit showing how the Advertising Club of Neosho has built up the business of Neosho through a plan of co-operative advertising and by co-operation among the merchants, to insure that all of the advertising done is so truthful as to insure that the customer who comes to Neosho will desire to make Neosho his regular trading point.

CIVIL-SERVICE EXAMINATION FOR ELECTRICAL ENGINEER, SIGNAL CORPS.

Examinations for Electrical Engineer, $2400 to $3600 a Year, and Assistant Electrical Engineer, $1800 to $2400 a Year, to Be Held Sept. 16.

The United States Civil Service Commission, Washington, D. C., announces open competitive examinations for the positions listed above, for men only. Vacancies in the Signal Service at Large at the salaries indicated, and in positions requiring similar qualifications will be filled from these examinations. Certification to fill the higher-salaried positions will be made from those attaining the highest average percentages in the examinations.

The duties of these positions comprise the development and design of electrical equipment and especially Signal Corps storage batteries, or the administration of commercial telephone systems and installation of Government-owned systems.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects: (1) education, training, and experience; (2) publications, reports, or thesis (to be filed with application). Under the first subject competitors will be rated upon the sworn statements in their applications and upon corroborative evidence.

For the position of electrical engineer, applicants must have graduated with a B. S. degree, preferably in electrical engineering, from a college or university of recognized standing, and also have received the E. E. degree after having completed the required courses of resident or nonresident work; and, in addition, have had at least two years' experience devoted in major portion to work involving one or more of the following subjects: Testing of electrical instruments or apparatus; research concerning radio apparatus; calibration and standardization of electrical meters and apparatus; teaching or theoretical and analytical research in physics, electrical engineering, telephony, or telegraphy; direction or management of electrical or physical laboratories; acceptable consulting engineering practice in telephony, telegraphy, radio, or electrical engineering other than power plant.

For the position of assistant electrical engineer, applicants must have received at least 59 credit hours for resident study in a college or university of recognized standing; and have had at least two years' experience devoted to the testing, standardization, and calibration of electrical instruments or apparatus; teaching in physics or electrical engineering; as laboratory assistant in physical or electrical laboratory; or in analytical electrical research or radio production or inside plant telephonic consulting engineering.

Under subject two, applicants must submit with their applications any publication or report prepared by them showing their fitness for the position for which they apply; or, in lieu thereof, they should prepare and submit with their applications a technical thesis on the design and development of some piece of apparatus for the Signal Corps.

Applicants will be admitted to these examinations regardless of their age; and regardless of their residence and domicile.

Further particulars regarding this examination are given on Circular 394 issued by the commission. All applications with statements as to training, experience, etc., and with reports, thesis, photographs, etc., must tomer who comes to Neosho, Mo., desire to make it his regular trading point.

Practice in Making Electric Utility Appraisals

Practical Methods Used in the Inventory of Land, Buildings and Outside Plant—Systematic Planning of the Inventory—Forms Used in Gathering Field Data

By CHARLES W. McKAY

THE previous articles in this series have confined themselves to a discussion of the general problems involved in electric utility appraisement. The present article, and those immediately succeeding, will deal with the practical problems involved in taking the actual inventory of an electric utility company's property.

From the article in the issue of the ELECTRICAL REVIEW for June 28, 1919, it will be remembered that the Direct Construction Cost is divided into two general divisions: Cost of Inventoriable Property and Incidental Construction Expense. The Cost of Inventoriable Property is again subdivided according to the major classifications of an electric utility company's physical property. These major classifications are:

1. Land.
2. Buildings.
3. Pole lines.
4. Conduit system.
5. Aerial wire and cable.
6. Underground wire and cable.
7. Transformers.
8. Central-station equipment.
9. Tools.
10. Supplies, etc.

Before taking up a discussion of the detailed methods to be employed in the actual inventory of the items represented by these major classifications it may be well to briefly discuss the general *modus operandi* of taking and recording field data.

The reader will doubtless appreciate that the volume of data involved in the appraisement of even the smallest electric utility plant is so great as to necessitate the utmost care not only in acquiring the data, but, also, in so recording them as to be subsequently intelligible. Otherwise the completed inventory would only present a hopelessly confused mass of well-nigh useless data.

Making Rapid and Accurate Utility Appraisals.

UTILITY rates are nowadays usually set after a valuation of the utility company's property has been made, this being to set at rest charges often loosely made that the company is earning big returns on watered capitalization. Even in emergency rate cases, where there is no time to make a complete valuation of the plant, provision is commonly made for a later revision of the rates when a subsequent valuation shows them to be too high or too low. In general, it may therefore be said that valuation is a quite usual concomitant of utility rate cases, and, because of the present exceptional importance of these cases, valuation of utility properties is a very timely topic for the utility manager.

In this article Mr. McKay discloses many valuable facts and makes important suggestions for carrying on an appraisal of electric utility properties, all based on his many years' experience as an appraisal engineer. The ideas and forms he suggests will be found to save much time and money in making the inventory and to increase its reliability decidedly.

This article is the fourth of a series of twelve on valuation and rates. In the first article, in the issue of May 17, Mr. McKay gave a general introductory discussion of modern utility regulation; his second article in the June 7 issue, included definitions of the principal terms used; his third article in the June 28 issue discussed reproduction cost as the basis of appraisement. The next article will consider appraisement, or valuation, of the inventory discussed in the present article. Mr. McKay will gladly throw additional light on any of these matters, if inquiries are addressed to him in care of the editor of the ELECTRICAL REVIEW.

There are certain preliminary steps which must be observed in the appraisement of any electric utility property to make it systematic and economical. These steps may be summarized as follows:

1. Determination of the purpose of the appraisal.
2. A general survey of the property by the engineer in charge of the appraisal.
3. A careful investigation of the utility company's records.
4. A review of the appraisal requirements of the public service commission, under whose jurisdiction the company operates.
5. A careful determination of the various types of construction used by the company whose property is under appraisement and the subsequent preparation of suitable field forms to record the inventory data.
6. Selection of employes for performing the task of inventory.

Determination of the Purpose of Appraisal.—Electric utility appraisals are used for various purposes and to avoid unnecessary refinement of detail in preparing the appraisal it is most necessary that the appraisal engineer shall make a careful study of the ultimate uses of the appraisal. The various uses to which electric utility valuations are put may be summarized as follows:

1. For presentation before a regulatory body in rate cases.
2. For determining fair value as a basis of subsequent financing.
3. For use as a basis for tax adjustment.
4. For accounting purposes.

Our present problem is confined largely to item 1—the preparation of an appraisal for presentation before regulatory bodies in connection with rate cases. It is well, however, for the appraisal engineer to make every effort to so prepare the ap-

praisal that it may be used for accounting, tax adjustment, financing, and other purposes.

Survey of Conditions.—Knowing the use to which the appraisal is to be put, the engineer in charge is equipped to prosecute the actual work of appraisement. To do so intelligently he must first make a general inspection of the property to be appraised, noting the geographical layout of the plant and determining, in so far as possible, the construction history of its component parts.

It is most important that this preliminary survey be made with the utmost care. A study of the geographical layout of the plant—especially if the property is a large one—will subsequently enable the appraisal engineer to so plan his work as to effect many economies in the cost of appraisement.

Investigation of the Company's Records.—After completing the preliminary survey the appraisal engineer should carefully review the company's records and map files. If the records are reasonably accurate, they may often be used as an aid to the field work. Maps of the plant, if accurate, may be used as a guide for the field engineers. The use of such maps frequently obviates many days work in the field in preparing ground layouts.

In reviewing the company's records the appraisal engineer should also determine to what extent these records may be used as a basis for building up the unit costs. *Reproduction* unit costs based upon *actual* costs afford the most conclusive evidence for presentation before state commissions.

Review of Commission Requirements.—If the appraisal is to be used in connection with a rate case —and we assume that it is in our present discussion— it is most important that the appraisal engineer shall thoroughly familiarize himself with the commission instructions referring to the presentation of inventories and cost data. The requirements of various state commissions vary widely and in view of the fact that the readers of the ELECTRICAL REVIEW are scattered all over the United States, it is deemed advisable to confine the present discussion to general, common-sense methods of inventory and appraisement. It is thought, however, that the appraisal methods presented in this series are flexible enough to facilitate their ready adaptation to the peculiar requirements of any commission.

In undertaking a specific appraisal problem it is most important that the engineer in charge shall carefully review the instructions of the local commission —otherwise he might subsequently be confronted with the embarrassing problem of entirely revamping his data to meet the commission's requirements.

Preparation of Field Forms.—The problem of preparing suitable forms for recording and summarizing the inventory data is a difficult one and its importance cannot be exaggerated. This whole subject will be discussed in detail in a subsequent portion of this installment. For the present suffice it to say that time expended in the preparation of suitable forms is well spent and should result in a minimum cost of appraisement and a maximum usefulness of the completed valuation.

Selection of Appraisers.—Many electric utility companies adopt the practice of employing a skilled appraisal engineer—and possibly one or two of his assistants—to supervise the preparation of the inventory and appraisal and to co-operate with counsel in the task of presenting the rate case before the state commission. These companies prefer to furnish the necessary help, in the way of field inspectors and office men themselves—the thought being that a sufficient number of men can be spared from the operating forces to undertake this work without impairing the operating efficiency and thus minimizing the cost of appraisement.

The adoption of this policy is questionable, but where it is adopted the task of selecting the men should be left entirely to the appraisal engineer.

In this connection it is interesting to note that the best operating employes often make the poorest appraisers. The engineer in charge of the appraisal is obviously best qualified to pick the men for his own peculiar needs.

FORMS FOR RECORDING THE INVENTORY DATA.

Having completed this general discussion of the steps preliminary to the actual task of taking the inventory, we are now ready to consider ways and means of recording the inventory data. The various plant classifications will be discussed in the order enumerated in the foregoing recapitulation—the first item being land.

Land.—It is most important that the land, owned by an electric utility company, be completely described so as to avoid subsequent embarrassment when the case is presented before the state commission. It is best to base such a description upon the records in the tax assessor's office. Usually such records are readily accessible to the appraisal engineer if he will but take the trouble to state clearly the use to which the information is to be put. Another source for obtaining authoritative information is the office of the commissioner of deeds or county recorder.

The following is an illustration of the form in which land inventories are prepared:

LAND OCCUPIED BY POWER HOUSE OF BLANK ELECTRIC LIGHT COMPANY.

Location: Southeast corner of 8th and Cedar Streets—City of ....., State of .....

Description: Lot No. 3, block No. 13, and that portion of lot No. 2, block No. 13, lying westerly of the easterly line of lot No. 3; Roberts and Randalls subdivision of the westerly addition to the city of ....., ...

Leaseholds and right-of-way are often considered as subdivisions of the land item. To illustrate: A certain company may have a 99-year lease on the parcel of land upon which its central station is erected. In many states a leasehold of this nature may be considered as one of the fixed assets of the company and therefore should be included in the appraisal.

Again, many electric utility companies have certain right-of-way privileges over private property covering the right to occupy such property for purposes of placing poles, underground conduits, etc. Such right-of-way may be frequently included in the appraisal and the value assigned to it will be entirely dependent upon the exigencies of the case in question.

In this connection it should be remembered that the present article is confined specifically to ways and means of recording and summarizing the inventory. We are therefore concerned only with the description of land and the various other major items of physical property—the question of values will be discussed in a subsequent article.

Leaseholds may be described in a manner similar to that suggested for describing the land proper. Right-of-way for pole lines is usually described only by stating the number of poles involved. For instance, if a certain company has 500 poles upon pri-

vate right-of-way, the inventory right-of-way item will be listed thus:—Right-of-way for 1000 poles @ (unit cost per item of right-of-way) .....

Buildings.—Many of the state public utility commissions have taken the stand that electric utility appraisers are not qualified to testify as to the value of buildings and that this phase of the appraisal problem should be relegated to building contractors or architects. Be that as it may, it is always well for the appraisal engineer to make his own careful inventory of the buildings and subsequently to appraise this inventory—even if it is merely used as a check upon the architect's valuation.

The inventory of buildings should include the following items:

1. Character of building—whether fireproof, slow-burning, non-fireproof, etc.
2. Over-all dimensions—length, breadth and height.
3. Detail of construction of building:
   - (a) Detailed description of foundation.
   - (b) Detailed description of walls.
   - (c) Detailed description of floors.
   - (d) Detailed description of roof.
   - (e) Detailed description of interior finish—if any.
   - (f) Any further general information that will assist in the appraisement of the building.

The description of a building as included in the appraisal should take somewhat the following form:

POWER HOUSE OF BLANK ELECTRIC LIGHT COMPANY.

Fireproof, brick and concrete building, located at the northwest corner of Third Street and Fourth Avenue.

Main building, 100 ft. long by 75 ft. wide by 30 ft. to peak of roof (25 ft. to wall plate).

Addition at north end, 25 ft. by 25 ft. by 15 ft. to wall plate supporting flat roof.

Detailed description: (Give detailed description of foundations, walls, floors, roof, etc., as suggested in the foregoing instructions).

Pole Lines.—The inventory of the outside plant of an electric utility company is obviously the most difficult problem confronting the appraisal engineer,

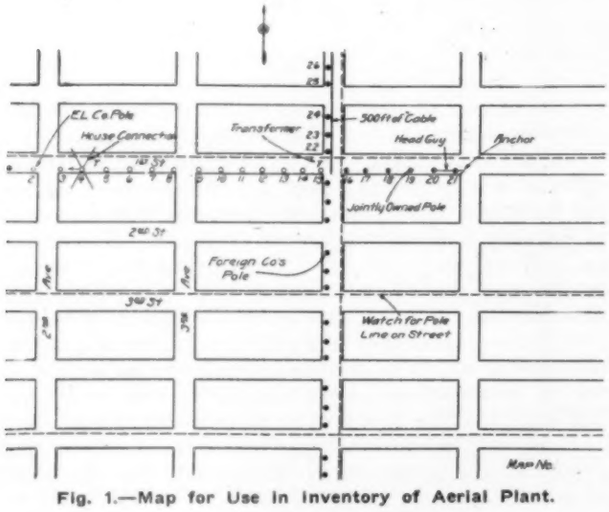

Fig. 1.—Map for Use in Inventory of Aerial Plant.

not that the items themselves are especially complex, but due to the fact that the various pole lines, primary and secondary circuits, underground conduit systems, etc., are scattered over a wide area. It is customary in electric utility appraisal work to undertake this phase of the problem first—weather conditions permitting. The inventory of the land, buildings, central-station equipment, and minor items may be taken at odd times when the weather is unfavorable for outside work.

It is customary to take the inventory of poles, anchors, guys, wire circuits and cables simultaneously. The appraisal engineer should first procure a map of suitable scale—say 400 or 600 ft. to the inch. Upon this map should be indicated the various primary and secondary circuit leads—the map will then serve as a guide for the field inspectors. If the plant to be inventoried is a large one the map should be suitably divided so that all of the inventory gangs will be assigned approximately equal portions.

Various pole leads may be indicated on these maps by a light pencil line and subsequently the field inspectors should show the actual pole locations as found in the field.

Such a map is illustrated in Fig. 1. The light dotted lines indicate the pole leads and the small circles the actual pole locations as found in the field. Guys between the poles are shown by a thin straight line and the anchors by arrows. Poles bearing transformers are indicated by the letter *T*. House connections are indicated by straight lines radiating from the poles.

A map of this character must be used in conjunction with a properly designed form for recording the field data. Such a form is illustrated in Fig. 2.

The following instructions should be helpful in understanding the use of the field form (Fig. 2) and the field map (Fig. 1):

1. Spot poles on the field map, Fig. 1, locating each pole as accurately as possible in relation to street and alley intersections. Poles belonging exclusively to the electric light company should be indicated by a hollow circle. Poles belonging exclusively to foreign companies (such as telephone companies) should be indicated by a filled-in circle. Poles belonging jointly to electric light and foreign companies should be indicated by a circle half filled-in. Spot only those poles belonging to foreign companies upon which there are wires or cables of the electric light company.

In some cases it may be found that the electric light company has in its possession maps giving the above information either in the code just referred to or in some other suitable code for distinguishing between the ownership of poles. In such cases these maps may be used by the field inspectors—providing they are carefully checked in the field and corrections made where the information given on the map is found to be inaccurate.

Before leaving any block make certain that the number of poles shown in the block is correct.

2. Number the poles consecutively as they are spotted (or checked), beginning the series with "1" on each map.

3. Use a separate line on the data sheet for each pole spotted on the map—whether the pole is owned by the electric light company or by a foreign company. Place the pole number in the corresponding ownership column on the data sheet. List only the wire, or equipment, belonging to the electric light company—ignoring all equipment owned by foreign companies.

4. In the column marked "Kind," indicate the material of the pole—using the letter "C" for cedar, "Ch" for chestnut, etc.

5. In the column marked "Setting," use the letter "D" for dirt setting, "R" for rock, "P" for pavement and "C" for pole set in concrete (concrete reinforcement).

6. In the column marked "Tree Trimming," use the letter "L" for light trimming, "H" for heavy trimming, "M" for medium trimming, and "C" for trees cut down.

7. Anchors should be divided into two general classifications, log anchors and patent anchors. Each of these classifications should be subdivided into heavy, medium and light anchors as indicated on the data sheet (Fig. 2). The distinction between heavy, medium and light anchors should be decided by the appraisal engineer before the field work is started and definite instructions should be issued to the field forces.

8. Under the column marked "Cable," give the gauge of the cable and the number of conductors.

The cable measurements (lengths) should be shown upon the map (Fig. 1) as indicated.

9. Under the columns marked "Condition," use the letter "E" for excellent, "G" for good, "F" for fair and "P" for poor. (This phase of the subject will be discussed more specifically in a subsequent installment on Depreciation.)

10. The field inspector should place his name, and the date on which the sheet was filled out, upon each inventory sheet. When several field sheets are used in connection with one field map these sheets should bear consecutive numbers.

11. Where a given pole line extends beyond the limit of the map mark the last pole with a cross inside of a circuit; colored chalk may be used for this purpose. Such a designation will indicate to the field inspector who happens to have the map of the adjoining section that this pole has already been taken—thereby eliminating duplications in the inventory.

12. Transformers should be marked on the map with a "T" opposite the pole on which they are located. In the column of the data sheet headed "Transformers" the size and make of the transformers should be noted.

Appraisal of Blank Electric Light Co.

Field Form for Poles, Crossarms, Wire, Cable, Etc.

Map No 1

Sheet	No 1	Name	Date
Field Work		A.J.W.	7-25-19
Ap'v'd By		C.W.M.	7-28-19
Compiled By		X.Y.Z.	7-29-19

Location				Poles																	Guying																Crossarms				House Connection	Line Wire						Cables			Transformer			
																					Log Anchor			Patent Anchor														Single		Double			Number of Wires													
On	Between		Pole No	Full Ownership	Joint Ownership	Owned by Others	Priv. Right of Way	Kind	Length	Diam. Top	Stepped	Trussed	Hub Guard	Setting	Tree Trimming	Painted	Condition	Light	Medium	Heavy	Light	Medium	Heavy	Head Guy	Tree Guy	Building Guy	Stub and Guy	Push Pole	Condition	Standard	Condition	Standard	Condition	Number of Crossarms	Condition	Wire Gauge	No 8 Ditto	No 6 Ditto	No 4 Ditto	No 2 Ditto	Condition	Diameter	No of Conductors	Gauge of Cable	Condition	Number of	Size Kw.	Make	Type
									Ft	In								No	No	No	No	No	No	No	No	No	No	No		No		No																					
			1																																																
			2																																																
			3																																																
1st St.	2nd Ave.	3rd Ave.	4	✓	X	X	X	C	35	7	✓	X	✓	C	L	✓	G	X	✓	X	X	X	X	X	X	X	X	X	G	X	2	X	F	X	X	X	X	4	G	4	X	X	X	3	F	X	X	X	X	1	10 K.W.		

Note: Complete Record of Pole No 4 (See Fig No 1) Given for Illustrative Purposes
Check (✓) Signifies that Item Falls in Column Checked
Cross (X) Signifies Nothing to Record, but Item has not been Overlooked

Fig. 2.—Sample Field Sheet for Recording Aerial Plant Data.

A set of instructions similar to the foregoing should be issued by the appraisal engineer at the beginning of every large appraisal task. If this is done, and the work of the field inspectors carefully supervised at frequent intervals, the accuracy of the inventory is assured and the possibility of embarrassing mistakes will be obviated.

This method of using a map in conjunction with the inventory sheet has another advantage—it facilitates the ready checking of the inventory by the commission engineer. The advantages of the adoption of this system—or some equally good system—can hardly be exaggerated. Each step of the inventory work is readily identified and even if errors should creep into the work they can easily be corrected.

It is thought from the foregoing rather broad discussion of the method of taking the inventory of poles, anchors, guys, wires, cable and transformers, that the reader will gain a general idea of the method usually adopted in work of this nature. A detailed discussion of this phase of the subject would exceed the space allotted to one article. However, if any questions should arise the author will be very glad to answer them.

Underground Conduits and Cables.—Even more care should be adopted in the inventory of the underground than in the aerial system. This is for the reason that underground systems are very expensive and an error of a few feet in the inventory may result in an appraisal error of several hundred dollars or more.

Another reason for exercising care in making an inventory of the underground plant is that subsurface distribution systems are usually so complicated that it is necessary to employ higher grade men than is the case in the recording of aerial inventories. Care in laying out the work will effect a saving of time on the part of the field inspectors and therefore a saving in expense. In this connection it is interesting to note that one experienced in the inventory of underground distribution systems can record accurately the data for from 50 to 75 manholes a day, whereas a novice in this type of appraisal work could not possibly cover over 15 to 25.

As in the case of the inventory of the aerial system, the combination map and record-sheet scheme is best adapted for insuring speed and accuracy.

The appraisal engineer should provide himself with a map showing the location of all the manholes. If such a map is not available, a skeleton map should be made and the manhole locations noted thereon. Information as to the position of the manholes, at least approximately, may usually be had by consultation with some of the older employes of the company whose property is under appraisement. The data, as thus obtained, may subsequently be checked by the field inspectors.

Fortunately, however, most companies maintain reasonably accurate records of their underground systems and these records frequently show not only the location of the manholes, but also information as to the numbers of ducts, locations and sizes of lateral leads and sometimes data relative to the size and gauge of the underground cables.

A typical underground map is shown in Fig. 3, while Fig. 4 illustrates a form of field sheet for recording the data. One of these sheets, obviously, should be made out for each manhole.

To illustrate the correlation of the field map and data sheet—as they are used in the appraisement of an underground system—the various steps necessary to the proper recording of the data for one manhole will be described in detail. Assume that the field inspector has completed his inventory of manholes 1, 2, 3 and 4. Using a 100 ft. steel tape the inspector and his assistant will carefully measure the distance between the center of the cover of manhole No. 4 and the center of the cover of manhole No. 5. It is most important that such measurements shall be accurate, as errors may amount to from one up to several hundred dollars a lineal foot. The best way to insure accuracy is to use surveyor's pins; counting

the pins and reading the last measurement on the tape, it is a comparatively simple matter to obtain accurate measurements.

While en route from manhole No. 4 to No. 5 the inspector will note the character of the pavement, or pavements, between the two manholes.

Arriving at manhole No. 5, the inspector will note

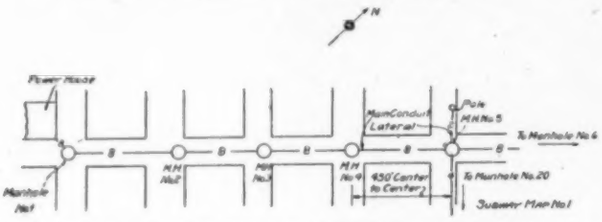

Fig. 3.—Typical Map for Subway Plant Inventory.

the manhole number and geographical location in the spaces provided therefor on the data sheet. The distance between manhole centers, 450 ft. in this case, will also be recorded in the proper place upon the data sheet. Assuming that the manhole covers are located centrally, with respect to the manholes themselves, the method of determining the actual conduit (trench) length will be apparent—deduct the distance between center of manhole cover and manhole wall, in each manhole, from the total center-to-center measurement.

After the cover for manhole No. 5 has been removed, the inspector will leave his assistant on guard on the surface while he descends into the manhole to obtain the necessary data. In this connection it is most important that municipal regulations as to protecting street openings shall be carefully observed. For instance, some cities require a man outside of the manhole to wave a red flag while the manhole is open.

Manholes are usually dirty and to insure the protection of the inventory records it is good practice for the assistant to note the data on the field sheets as it is called out by the inspector in the hole.

The following data should be obtained and noted in the spaces provided therefor:

1. Material of manhole—brick or concrete.
2. Measurements of manhole—length, width, distance from roof to floor and distance from street level to floor.
3. Diameter of cover casting.
4. Distance from center of cover to walls where the ducts enter the manhole—this for the purpose of obtaining actual duct lengths as referred to in a foregoing paragraph.
5. Number of ducts on each wall face, internal diameter of ducts and material of which they are made.
6. Where more than one duct enters a manhole wall the formation of the ducts should be shown on the spaces provided therefor in the manhole diagram. To illustrate: An 8-duct subway may consist of two 4-duct tiles placed one on top of the other, or it may consist of two parallel 4-duct tiles. It is important that the formation of the ducts should be noted, as this has a material bearing upon the cost per trench foot. It requires a wider trench to lay two 4-duct tile horizontally than to place one on top of the other. (It will be noted that the manhole diagram shows the four walls of the manhole folded back in the plane of the manhole floor. This is the simplest and most satisfactory method of diagrammatically picturing the inside of a manhole.)
7. The enveloping material of each subway entering the manhole should be noted. Electric light subway systems are sometimes surrounded by a complete concrete envelope. In other types of construction the ducts are laid on a concrete base and are roofed with concrete while the sides are left unprotected.
8. Care should be observed in noting all branch conduits leaving the manhole. Subsequently these branches should be located and measured.
9. The size of cable—whether 2-conductor, 3-conductor, 6-conductor, etc.—should be noted. The cable diameter should be determined. This for the reason that standard cables of a certain diameter contain a given number of pairs of a given gauge. Knowing the diameter, therefore, it is a comparatively simple task to compute the size and gauge of cable.
19. The amount of manhole slack cable should be determined and the center-to-center measurement (450 ft.) should be increased to allow for the slack.

It will be noted that Fig. 4 calls for some additional data—the nature and method of determining these data will be obvious. A set of instructions similar to the foregoing should be provided to the field inspectors in every large electric utility appraisal.

We have now briefly covered the subject of the inventory of all of the major items of the physical property of an electric utility company—with the exception of central-station equipment, tools, and supplies. In other words, we have covered the more complex and the more difficult—from the standpoint of the inventory—portion of the appraisal. The inventory of the central-station equipment is, of course, most important, but it is concentrated in a comparatively small area, is easily identified and, therefore, easily appraised.

The next article in this series will deal with the *appraisement* of the land, buildings and outside plant. In other words, we will proceed to appraise the inventory we have just completed. The inventory and appraisal of the central-station equipment, tools and supplies may best be treated in one article as it is often possible to make the inventory and appraisement simultaneously. In other words, experienced appraisers can frequently set down the prices opposite the item as they are listed in the inventory, although of course this does not apply to the larger items of

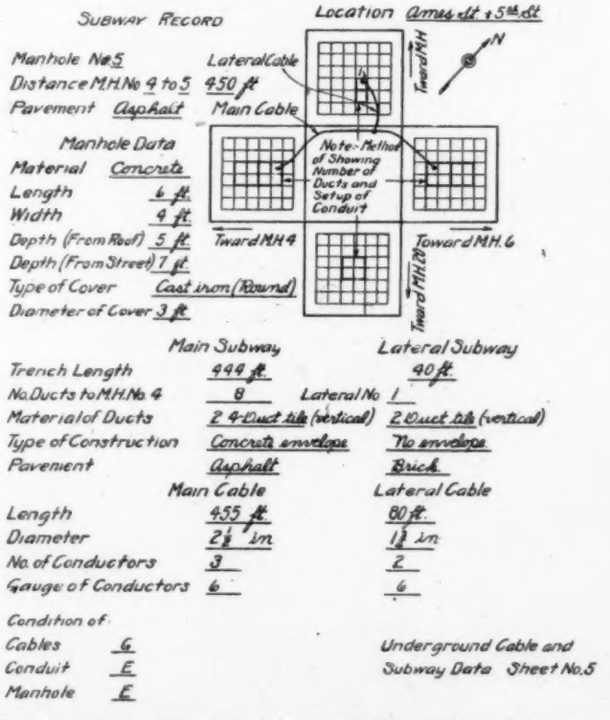

Fig. 4.—Sample Field Sheet for Recording Underground Cable and Subway Data.

central-station equipment, such as engines, turbines and generators.

The author will be very glad to answer any questions regarding this article, or the preceding ones, if addressed in care of the editor of the ELECTRICAL REVIEW.

Central-Station Rates in Theory and Practice

Fifth Article — Apportioning the Demand Charges According to Consumers' Maximum Demands—Assumptions as to Coincidence with Peak Load of Station and as to the Actual Demand

By H. E. EISENMENGER

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This is the fifth article of a series appearing weekly throughout practically this entire volume. A general outline was published in the July 5 issue and the first article appeared in the issue of July 12. The first few articles discussed costs in general and showed that the cost of electric service comprises three elements—energy, demand and consumer's costs. Several of the recent articles have treated of various features of the demand costs, which will be continued in a few more installments. After the cost analysis has been completed, the discussion of rates, which depend largely on cost, will be taken up.

PART I—THE COST OF ELECTRIC SERVICE—Continued.

II-A. The Three Elements of Cost.

B. Apportionment of the Demand Cost between the Customers.

3. Central Station's Peak Extending Over a Certain Period of Time.[1]

SECTION **30.** The exact method of determining the demand cost, as mentioned in the last issue, and as set forth in detail in Insert VI, can of course be used in practice only for larger groups of consumers (for instance, for the power consumers where we can separate the load curves for light and power). An application to individual consumers is entirely out of the question, unless we have to deal with consumers of exceptional magnitude, for instance, a railway company supplied with traction power. For smaller individual consumers the method would be far too complicated.

31. Even if we are satisfied with the consumer's peak responsibility as exclusive basis for the demand—assuming for the moment that this scheme would be commercially feasible—we would discover at the first attempt that it is impossible to determine the time of the central station's peak load exactly to the second or even to the minute. The maximum of the central station's load will extend over a period of perhaps 10 or 20 minutes, or more, at practically constant load, and this peak may even be repeated on several days, during the year. The changes of the central-station load within these peak periods will be so small that the eye cannot detect them on the chart, whereas the load of the consumer during these periods may vary between zero and 100%.

32. But even if it were possible to discern a certain moment of time of one or a few seconds' duration during which the load of the central station is larger than at any other moment of time and disregarding the statements of Sections 28 and 29, we would still have to consider the loads in the neighboring moments of time because they influence the necessary size of the plant on account of the overload capacity of the equipment.[2]

33. For these two reasons we have to extend the theoretical moment at which the peak-load responsibility takes place over a certain length of time, 2 minutes, or 10 minutes, or 30 minutes, etc. Just how long this period should be chosen depends on the shape of the highest portion of the load curve of the central station (short and steep or round and flat). This taking into account of the "near-peak load" is at the same time an approach to the fulfillment of the postulates of the exact theory as set forth in Insert VI. (Compare also Sections 28 and 29.)

34. During the assumed duration of the central station's peak load the load on the central station will be practically constant. But the load of the respective individual consumer or group of consumers during that interval may vary within wide limits, in fact from 0 to 100%. The question arises, then, which one of the loads of the consumer is to be taken as peak responsibility. Evidently we have to assume some kind of average of the consumer's loads during the interval.

35. If the central station's equipment would not have any time element involved in its overload capacity we might simply take the arithmetical average of the consumer's loads, that is, the number of kilowatt-hours consumed by him during the central station's peak-load interval, divided by the duration of that interval (in hours, or fractions of an hour).

36. But as stated above, the overload capacity of a large portion of the equipment (generators, transformers, cables and other electrical apparatus) depends on the temperature rise of the equipment,

[1] As the peak responsibility is generally not made the basis for the demand cost in practice, the principles deduced in this and the following sections are not practically applicable to the peak responsibility, but they are reflected in the practical methods of determining the basis for the consumers' demand cost (maximum demand, see later Section 38 et seq.).

[2] The load which electrical machinery, cables and other apparatus is able to carry is in general determined by the temperature rise, that is, by the heating effect of the current being generated in, or passing through, the respective equipment. We can therefore put a heavier load than normal (24-hour load or "continuous rating") on electrical equipment without doing any damage, provided that the overload does not last longer than until the maximum permissible temperature is reached. The heavier the overload, the shorter is the period during which it may be applied without damage. For instance, electrical machinery will generally be able to carry a momentary overload of 50% of the continuous rating, but it will stand only about 125% of the continuous rating for half an hour without overheating. Now, it is clear that if we have loaded the equipment, for instance for 29 minutes, with 125% it will no longer be able to safely withstand immediately afterwards an overload of, let us say, 15% as long as it would otherwise.

that is, on the combination of the heating effect of the current passing through, or generated in, the equipment and the cooling effect of convection, radiation, etc. This fact suggests the choice of another average for the value of the consumer's peak responsibility such as would be furnished by the readings of an instrument constructed to register the maximum temperature rise of an element which is heated by a conductor connected in series with the consumer's load. (Wright demand meter, see later Insert XVI.) The instrument would thus reproduce to a certain degree the heating effect developed in the electrical machinery.

It must not be left out of consideration, however, that the heating and cooling effect of such an instrument may be—and generally is—different from the corresponding effect on the electrical machinery, not only in size but also in its variation with time, although they follow similar laws.[3] Also the heating curves of the various parts of the electrical equipment are different from one another.

The question which one of the two averages to choose is further complicated by the fact that the temperature rise determines the overload capacity for a certain portion only of the central station's equipment, whereas the permissible overload of other parts of the equipment is determined by other factors without any time elements entering.[4]

37. Neither of the two averages will, therefore, give an entirely correct solution and we can hardly say that one solution comes much nearer the theoretically true value than the other. We have, moreover, moved so far from the exact theoretical conditions of the problem by the previous simplifying assumptions[5] that these nicer distinctions and details of the influence of the duration of the loads and overloads on the demand cost are entirely obliterated and swallowed in the inaccuracy introduced by these approximations. For all these reasons we cannot say that we ought to give the preference to either method of averaging the instantaneous demands during the peak-load period.

4. The Consumer's Maximum Demand and Substitutes Therefor.

38. Even allowing all the approximations for the computation of the consumer's demand cost which have been made so far (see footnote[5] to preceding section), conditions would still be too complicated for practical application to the individual consumers, except to those of the very largest size. In order to compute the demand cost of every consumer on the basis of his peak responsibility it would be necessary to know every consumer's peak responsibility. We would have to place a curve-drawing wattmeter or ammeter (which are very expensive instruments) on every consumer's premises. At the end of the year we would have to find out from a similar instrument in the central station just at what date and what hour the peak load of the central station has occurred and then determine from every individual consumer's chart how large his average peak responsibility has been during the period of the central station's peak load. All this is obviously a commercial impossibility, on account of the high cost not only of the necessary instruments but also of the handling of their record charts. For this reason we have to apply a further approximation to determine the consumer's share of the demand cost, as follows.

39. We do not determine the consumer's kilowatt demand at the time of the central station's peak load, but rather his demand at the time of his own peak load, that is, his "maximum demand" in kilowatts (or watts) regardless of the time when it occurs, the assumption being that the consumer's maximum demand is proportional to his peak responsibility. This is rather a bold assumption, inasmuch as it seems to amount to nothing less than that the shapes of all the load curves of all the consumers are similar amongst each other and thereby also to the central station's load curve. But, as will be shown later (Section 42), the error introduced by this assumption can be materially reduced by classifying the consumers into groups of such character that the curves of all customers within each group are liable to be similar to each other (compare also Section 9); the choice of the consumer's maximum demand instead of his peak responsibility becomes then entirely justifiable.

40. A consumer's maximum demand is much more easily and cheaply determined than his peak responsibility. We can use comparatively inexpensive instruments for that purpose, the so-called maximum-demand meters or demand indicators. These instruments indicate only the maximum demand during any chosen period, just as a maximum thermometer records the maximum temperature during any chosen period. And just as a maximum thermometer is very much cheaper than a curve-drawing thermometer, so a maximum-demand indicator is much cheaper than a curve-drawing wattmeter, not to speak of the cost of the handling of the charts.

Or we can use another type of instrument, the so-called demand limiter, which automatically limits the amount of the maximum demand of the consumer by interrupting his current and making his lights flicker as soon as he exceeds the given amount of demand. He can, therefore, never cause a greater demand cost than the adjustment of the instrument will permit.

With a corresponding sacrifice of accuracy we can even go so far as to abandon all such instruments. We can simply estimate the maximum demand to be expected from the size and character of the installation. This will be discussed more fully when we come to the systems of charging, that is of making the rates or prices (Part II of this series of articles).

41. It has been shown above that where the consumer's peak responsibility is made the basis of the demand cost we have to take the consumer's demands over a certain period of time and then take an average of all these instantaneous demands. Similarly, we have in this case also to take not the instantaneous demand of a given moment but the average of all the instantaneous demands during a certain period of time when the demands are at and near their maximum, including the elements of time shortly before and after the real maximum demand occurs. The average may again be the arithmetical mean or the heating equivalent, as has been explained in Section 36. The instruments employed to determine this maximum demand will be described later in Insert XVI.

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[3] See "Rates and Rate Making," P. M. Lincoln, Transactions A. I. E. E., 1915, page 2279.

[4] Thus the boilers and prime movers (this term means the non-electrical machinery driving the dynamos) respond to overloads by a reduction in efficiency and an increase of wear and tear; the distribution lines do not allow of any overload at all, as this would result in an excessive drop of voltage which should be avoided even for the shortest period of time.

[5] Mentioned in the second footnote of Section 17; also, the further assumption that the demand cost is proportional to the peak responsibility is an approximation. In addition to these the assumption to be made later for practical application that the consumer's maximum demand is proportional to his peak responsibility.

Insert VI—Appendix to Section 28—Continued.

1. Curve "h."

Given curve "B," that is, the load curve of the central station, it must be transformed in such a way that the ordinates are arranged from left to right in the order of their lengths, to get the curve "h."

The construction of this curve is as follows (see Fig. 1[1]). We have to cut up, as it were, the whole area under the curve B into vertical strips of very small (infinitesimal) width dt and then rearrange these strips in the order of their magnitude from left to right. One of these strips is shown shaded in Fig. I.

From the highest maximum of B, that is from the point B_{m_1}, a horizontal line is drawn towards the axis of ordinates; it intersects the latter at the point H. This point evidently is the starting point of the h-curve. Considering now some other ordinate h_1, there will generally exist at least two points u_1 and u_2 on curve B which correspond to this ordinate. If now we select all those of the above-mentioned vertical strips which are higher than h_1, in order words, which correspond to ordinates larger than h_1, and arrange them side by side beginning from the axis of ordinates in order of their magnitude, these strips will take up a space of the width $= u_1u_2$. The curve h will therefore contain a point with the ordinate h_1 and the abscissa $u_0U = u_1u_2$. In the same manner any number of points of the curve h can be found. If the respective parallel to the axis of the abscissae intersects the load curve of the central station in more than two points—for instance, in v_1, v_2, v_3, v_4, then v_0V must of course be made equal to the sum of $v_1v_2 + v_3v_4$. It will be noticed that the h-curve has several breaks, at W_1, W_2 and W_3. Every maximum (other than the peak load B_{m_1}) and every minimum of the B-curve causes such a break, as is easily understood from the construction of the h-curve. Usually the B-curve extends over a complete cycle, which means the end ordinate (point B_8) has the same height as the initial ordinate (point B). If this is not the case, as has been assumed for the sake of getting a general case in Fig. I, the end ordinate at B_8 or the initial ordinate at B, both, will also cause such a break.

In Fig. H, which starts from an assumed h-curve, this curve is so chosen that it does not contain any such breaks, but the method of the subsequent construction is exactly the same where such breaks occur. (Also see Fig. L.)

2. Curve "a."

According to the definition (see Fig. F) a is the instantaneous demand of the respective customer at the moment when the total demand on the central station equals h. Fig. I shows, however, that usually there is more than one value of instantaneous demand of the customer corresponding to a certain given amount of load of the central station, since that given amount of central-station load will generally occur more often than once. Thus, for instance, in Fig I when constructing the point U of the h-curve which has the ordinate h_1 we found that there are two points in the central station's load curve B which have that same ordinate h_1; consequently, there will be also two ordinates (generally of different lengths) of the customer's load curve b corresponding to that ordinate h_1 of the h-curve. They are r'_1r_1 and r'_2r_2. The question arises which one of these two ordinates should be chosen. Resuming the above-mentioned method of cutting up the area into vertical differential strips it is clear that the strip attributed to point U actually is composed of two parallel strips side by side, each one having a width $dt/2$, one of which owes its existence to r'_1u_1, the other one to r'_2u_2. It is evident from this that the ordinates of the a-curve must be equal to the arithmetical mean of the different ordinates of b belonging to the respective point of the curve h.

Thus $U'a_u = (r'_1r_1 + r'_2r_2)/2$.

Every one of the breaks of the h-curve mentioned above (W_1, W_2, and W_3 in Fig. I) is connected with a sudden drop (or rise) in the ordinate of the a-curve. Thus, for instance, for the abscissa OW'_1 the a-curve takes a sudden jump downwards from a_1 to a_2. The reason for this is that at this abscissa the ordinates of the second peak (B_{m_2}) of the B-curve enter into the h-curve and consequently the ordinate of the a-curve is no longer the arithmetical mean of *two* ordinates of the b-curve, situated on either side of the peak B_{m_1}, but it suddenly becomes the arithmetical mean of *four* ordinates of the b-curve, one on either side of B_{m_1} and one on either side of B_{m_2}.

3. Curve "q."

Whereas the ordinates of the two curves "h" and "a" dealt with heretofore are given in units of kilowatts, the term of $q = a/h$ is an abstract number and a certain length must be chosen as unity. It has been mentioned before that the maximum demand of the central station (OH in Figs. H and I) should be chosen as unity.

The construction of curve $q = a/h$ is obvious and hardly needs any explanation. It is shown in Fig. J for a certain abscissa Op_1. H_1 and A_1 are the points on the curves h and a, respectively, belonging to the abscissa Op_1. O' is chosen somewhere on the axis of abscissae in a convenient position. H'_1 is found as the intersection of the extension of line $O'H_1$ with a horizontal line drawn from the starting point H of curve h (compare Fig. I). Q'_1 is found as the intersection of $p'_1H'_1$ and $O'A_1$; a horizontal line from Q'_1 furnishes in its intersection with p_1H_1 the required point Q_1 of the curve of q.

$$\frac{p'_1Q'_1}{p'_1H'_1} = \frac{p_1A_1}{p_1H_1}$$

and, since $p'_1H'_1 = OH$ has been assumed as unity,

$$p'_1Q'_1 = \frac{p_1A_1}{p_1H_1} = \frac{a}{h} \text{ or } p_1Q_1 = \frac{a}{h} = q.^*$$

Where possible, the location of O' should be chosen so that $p'_1H'_1$ coincides with the axis of ordinates, which saves a little labor.

Every break in the h-curve mentioned above with consequent sudden drop or rise of the a-curve corresponds to a sudden drop or rise in the q-curve (see Fig. L).

4. Curve "f".

According to the definition, the ordinates of the f-curve for a given abscissa Om' (see Fig. H) are represented by the

[1]To avoid misunderstandings it should be kept in mind that Fig. I deals with the construction of the h-curve and the a-curve from a given B-curve and b-curve, whereas Fig. H deals with the construction of the q, f and g-curves, beginning with an assumed h-curve which is not identical with the h-curve arrived at in Fig. I. Fig. L (see later), being an example from practice, will then show how the different operations tie together if carried out consistently on the same set of curves.

*An additional feature of the construction of the curve q is the following: $q = a/h$, differentiate with respect to the time t (the abscissa):

$$\frac{dq}{dt} = \frac{h\frac{da}{dt} - a\frac{dh}{dt}}{h^2}$$

From this we see that q reaches a maximum (or minimum) if

$$\frac{\frac{dh}{dt}}{\frac{da}{dt}} = \frac{h}{a},$$

in other words, if the tangents of such points of the two curves h and a as have the same abscissa intersect each other on the axis of abscissa (for instance, abscissae Om_1 or Om_2 in Fig. H). By means of this principle it is easy to predict with a fair amount of precision the position of the maxima and minima of the curve q.

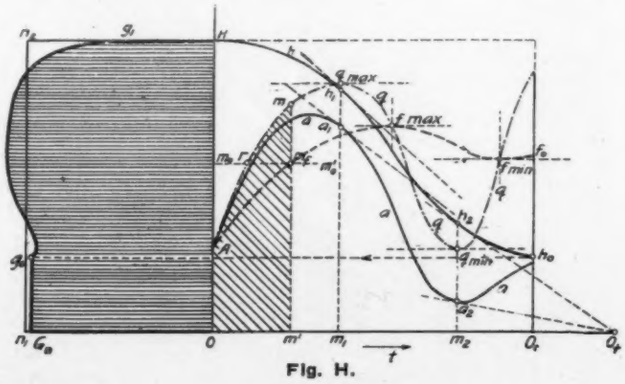


Fig. H.

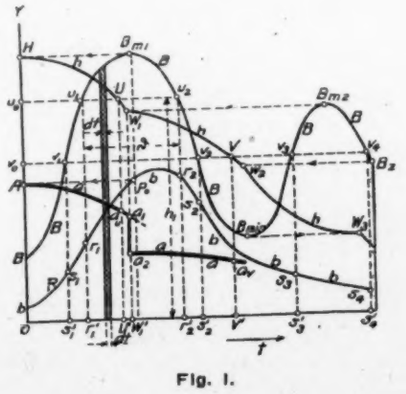


Fig. I.

height of a rectangle erected over the base Om' and enclosing the same area as the surface enclosed by the curve q, the ordinate over the point m' and the two axes of co-ordinates. This last named area is shown shaded diagonally. If we desire therefore to find that point m_t of curve f which belongs to a certain abscissa Om' we have to select a horizontal line $m_o m'_o$ at such a height that the two three-cornered figures $Am_o r$ and $mm_t r$ have the same area. The use of a planimeter will generally not be necessary and a person with fairly good

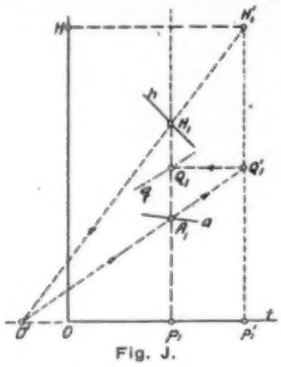


Fig. J.

eye-measure will be able to locate these horizontal lines accurately enough by the eye.

A few additional characteristics as explained hereafter of the curve of f will facilitate an exact and rapid construction of that curve.

Maxima and Minima.—Since the ordinate of every point of f is the arithmetical mean of all preceding ordinates of the curve q, it is evident that f will have either a maximum or a minimum every time it intersects curve q. Thus, for instance, in the left part of the f-curve in Fig. H the ordinates of q are larger throughout than those of f, therefore with increasing abscissae the arithmetical mean of the ordinates of q will grow, that is, curve f will rise. As soon as q falls below f, that is, to the right of the intersection point f_{max} of the two curves, every addition of a new ordinate of q will decrease the average and f will assume a falling tendency until the next intersection point f_{min} is reached, etc.

Direction of tangents of curves.—Expressing the definition of f mathematically we get

$$f=\frac{\int_0^t q\,dt}{t}$$

where f is the ordinate of the curve of the same name and t is the abscissa. From this we get $ft=\int_0^t q\,dt$ and differentiating

$$f\,dt + t\,df = q\,dt$$

$$\text{or } \frac{df}{dt}=\frac{q-f}{t} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

this means with reference to Fig. K that $t_t m_t t_t$ (the tangent to the curve of f) is parallel to $m_o m t_o$ where m_t is again (as in Fig. H) the horizontal projection on the axis of ordinates of the selected point m_t and m is the point on curve q with the same abscissa as m_t; we thus get easily and quickly the direction of the tangent of every point of curve f. From the definition of f it follows that the curve of f will start from the same point A of the axis of ordinates as the curve of q. (Figs. G, H and K.) For this point A ($t=0$, $q=f$) equation (2) changes into

$$\frac{df}{dt}=\frac{0}{0}=\frac{dq}{dt}-\frac{df}{dt} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2^*)$$

Now $\left(\frac{dq}{dt}\right)_{t=0}=\tan\phi_o$ (see Fig. K) and $\left(\frac{df}{dt}\right)_{t=0}=\tan\psi_o$.

Substituting this in equation (2*)

$$\tan\psi_o = \tan\phi_o - \tan\psi_o$$

$$\tan\psi_o = 1/2\tan\phi_o.$$

This equation allows us to rapidly and easily find the angle at which f rises from its starting point A on the axis of ordinates.

Every sudden drop or rise of the q-curve as mentioned before causes a sudden change in the direction of the f-curve, but in practice these changes in direction, especially for large abscissae, will be imperceptible (Fig. L).

5. Curve "g."

The construction of the curve of g is so simple that it hardly needs any explanation. Select a point on curve h (Fig. H), draw a horizontal line from the same to the left beyond the axis of ordinates and on that line from its intersection with the axis of ordinates step off that ordinate of the f-curve which belongs to the same abscissa as the originally selected point of h. Repeating this for a number of points we arrive at the curve of *"g."*

After we have thus reached, from left to right, the point which corresponds to the lowest value $O_o h_o$ of the h-curve (at the extreme right of the latter) the ordinates of the g-curve are constant and equal to the terminating value $O_o f_o$ of the f-curve. The g-curve, beginning from the point T_o, will therefore change into a straight line parallel to the axis of abscissae OH of the g-curve, that is, to the axis of ordinates of the rest of the curves. (That this must be so is easily understod if we go back to Fig. G.)

Summary.

This whole procedure of establishing the equivalent demand is not a very simple one, but it is more simple than it appears at first sight. It must also be considered that the problem itself, as has been shown above, is an inherently intricate one and involves a great many factors.

We see that the consumer's demand cost is an intricate function of the *entire* load curve of the central station *and* of the *entire* load curve of the respective consumer, not only of certain parts of those curves. The equivalent demand and consequently the demand cost, is represented by the shaded area of curve *"g,"* Fig. H, and instead of being simply proportional to the peak responsibility it is a true integral extending over all elements of time over which the load curves extend[2]. As will be demonstrated in the following, however, at those times when the central station's load is low the influence of the consumer's load is small and ultimately even becomes practically negligible compared with the influence of the consumer's load at or near the central station's peak load time. Yet all these infinitesimal influences of the various differentials of time are of the same *order* of magnitude.

It is obvious that the f-curve (which represents by its ordinates the respective areas under the q-curve) has the tendency of approaching more and more a horizontal straight line as the abscissa increases, that is, as the instantaneous load h of the central station decreases. (Supposing, for instance, that the f-curve stands at $0.1\times OH=0.1$† at the end of the first hour and that $q=0.3$ throughout the following hour; then at the end of that hour, f will have risen to $(0.1+0.3)/2=0.2$, or by 0.1, or by 100%. If, however, the f-curve stands at 0.1 as above, not at the end of the first hour but at the end of the 23rd hour, and q is again $=0.3$ throughout the following hour, then at the end of that hour f will be only $(23\times 0.1+0.3)/24=0.1125$, or it will have risen only by 0.0125, or by 12.5%.)

This means that the values of the consumer's load for small central-station loads (large abscissae of h-curve),

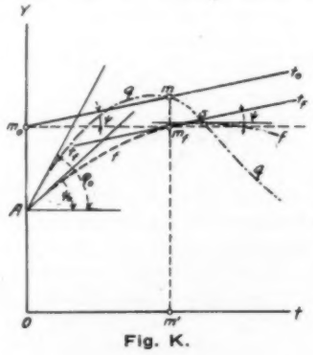


Fig. K.

where the f-curve is already steadied, will not be able to affect the equivalent demand and the demand charges as much as the consumer's load at those particles of time, when the central station's load is near its peak. The consumer's loads near the central station's peak load have a greater influence than where the central station's load is small, so much so that in the generality of cases at all moments when the central station's load is not near peak load the amount of the consumer's load need not be considered. Nevertheless, as will be shown by an example from practice a little later (Fig. L), *the equivalent demand may be very far off from the peak responsibility.*

Theoretically the load curve would have to be taken over

[2] This integral is, of course, not identical with the integral which gives the energy consumed $\int_0^t b\,dt$ (Fig. I) and it is of a much more complex nature. Further investigations (which are omitted here) show that it is a double integral.

†It should be remembered that OH has been chosen as unity.

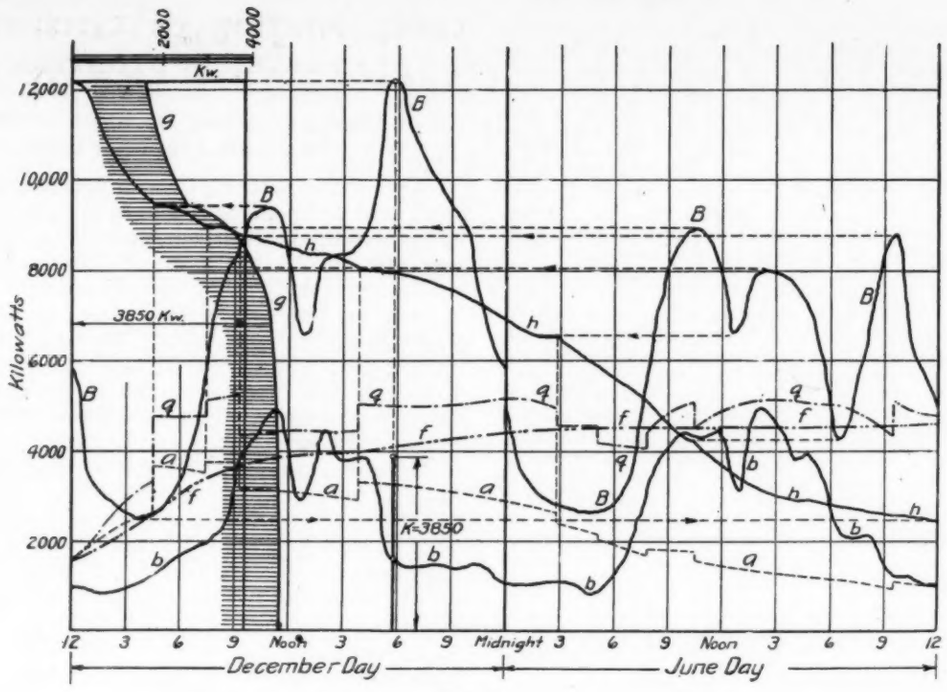


Fig. L.

the whole year. But in practice this is neither possible nor necessary. In ordinary cases it will be sufficient to take one typical day around the winter and one around the summer solstice.

Fig. L is an example from practice showing the curves of a large central station which was the first one to employ this method devised by the author. The diagram has the purpose of determining how the aggregate peak load for light and power should be apportioned between the power consumers and the lighting consumers, in other words, how large the aggregate equivalent demand of each one of these two groups is. Fig. L shows the total lighting and power curve *B* and the power load curve alone *b*. A December day and a June day were selected as representative of the extreme seasons of the year. We see plainly how every peak and every valley of the *B*-curve causes a break in the direction of the *h*-curve, as explained before, and a sudden jump up or down in the *q*-curve. The resulting breaks in the direction of the *f*-curve are so small that they are hardly discernible in the left-hand part of the curve and disappear entirely to the eye after the first quarter of the total abscissa. We see from this practical example also how the *f*-curve as well as the *g*-curve[3] become practically level, beginning about the second half of the respective total abscissa.

The peak load of the central station occurs shortly before 6 p. m. in December and amounts to about 12,200 kw.; the peak responsibility of the power load is only about 1600 kw. The equivalent demand, however, in consequence of the great power demand at other hours is not less than 3850 kw. or nearly 2½ times as high as the peak responsibility. The balance of 12,200 — 3850 = 8350 kw. is charged to lighting.

Note.[4]

A glance at Figs. A(a) to A(g) shows that in each case customer *B* has used 600 kw. continuously during the hours between 2 o'clock and 6 o'clock. If the equivalent demand for *B* is figured by the same method as given above (see page 185) but on the basis of Figs. A(a) to A(d), the results will be the same as before in Fig. A. On Fig. A(e), however, we get the following result from the equivalent demands:

Customer A. . . . . ⅓ × 400 + ⅕ × 200 + ⅓ × 400 = 306⅔ kw.
Customer B. . . . . ⅔ × 400 + ⅘ × 200 + ⅔ × 400 = 693⅓ kw.

1000 kw

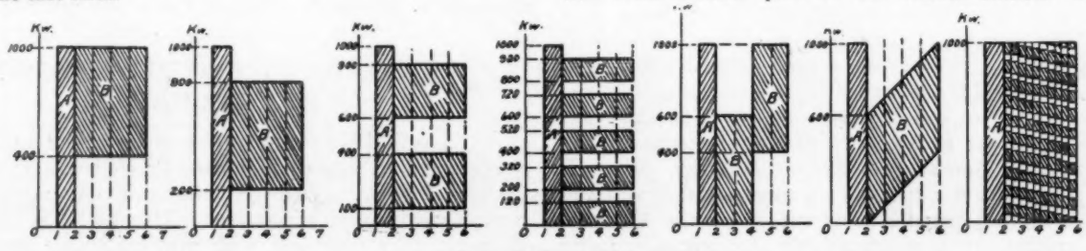
This is very different from the result given on the basis of Fig. A or Figs. A(a) to A(d). If *A* and *B* were to deal directly and independently with each other about the use of the central station (for instance, in case they are joint owners of the central station) *A* might contend that the distribution of the demand charges should be made according to Fig. A(e), whereas *B* would probably claim that the load curves should be drawn as in Fig. A and not as in Fig. A(e). Who is right, *A* or *B*?

The 1000-kw. central station might be imagined in this case to consist of five units of 200 kw. each (it does not matter for the purposes of this deduction whether these five units are actually in physical existence as such or not). According to Fig. A, customer *B* would use none but the first three of these units (counting from the bottom up in the drawing). If Fig. A(a) is made the basis of the computation, he would be using only the three uppermost units, etc. In Fig. A(e) customer *B* would use the three lowest units for the first two hours and the three uppermost units for the last two hours.

Let it now be supposed that this latter assumption [Fig. A(e)] be permissible; then evidently there is no reason why the total time between 2 and 6 o'clock should be divided into only two periods of that kind. With the same right, four subdivisions of time might be assumed, of one hour's length each, or eight, etc.; in fact, there is no upper limit to the number of subdivisions of that period. We can, therefore, assume an infinite number of very small periods and suppose that during each one of these periods *B* is drawing his 600 kw. from another part of the central station. This may

[3] In order to save space in the drawing, the ordinates of the *g*-curve have been stepped off to the right of the main axis of ordinates instead of to the left as on the other illustrations. The *g*-curve is emphasized by shading.

[4] Referring to first paragraph in the second column of page 185 of the last issue.



Figs. A(a) to A(g).

result for instance in Fig. A(f). If Fig. A(e) is permissible as a basis of computation, moreover, we are certainly at liberty to assume the subdivision of the demand of *B* also in the manner indicated in Figs. A(c) and A(d). This subdivision in vertical direction can also be carried out to finer and finer degrees, and can be combined with the manner of subdivisions shown in Figs. A(e) and A(f); this will result in a distribution of the demand about as shown in Fig. A(g). If these combined subdivisions are carried out to sizes of infinitesimal order this obviously means that the demand charge be distributed proportionately to the number of kw.-hr. used, independently of the shape of the load curve. This evidently is absurd; therefore, the basic assumption of the whole conclusion must be wrong. This initial assumption has been that the distribution according to Fig. A(e) is permissible and we arrive, therefore, at the conclusion that the distribution according to Fig. A(e) is wrong. With two customers only the distributions of the load curve of the type of Figs. A, A(a) to A(d) are the only ones which are correct, but not A(e) and A(f), and it is easy to see that they all have the same result as to the equivalent demand charge. An analogous deduction shows that with three or more customers the load curve of every single customer must be drawn in the customary way in order to obtain correct results; that is, with the axis of abscissae as a basis from which to step off all ordinates of every single load curve, as in Fig. A.

(To be continued.)

FISCAL YEAR'S FOREIGN TRADE EXCEEDS TEN BILLION DOLLARS.

All Records Broken as to Exports and Imports—Excess of Former in Last Five Years Exceeds That of the Preceding 125 Years.

An excellent indication of the growth of American business in the last few years is given in the following figures on our extraordinary foreign commerce of the last fiscal year.

United States commerce in the fiscal year which ended June 30 broke the record in many particulars. Both imports and exports were the largest in the history of our foreign trade, and the grand total for the first time crossed the $10,000,000,000 line; the "favorable trade balance" exceeded that of any earlier year, and the closing month, June, wound up the spectacular record with a total trade of $1,211,282,450, an average of nearly $50,000,000 a day in the 26 business days of the month. The value of the merchandise forming the foreign commerce of the United States in the fiscal year 1919 was one-half as large as that forming the entire international trade of the world in the year preceding the war.

The exact record of this remarkable year in our trade was, according to a statement by the National City bank of New York: Imports, $3,096,000,000, against the former high record of $2,945,655,000 in 1918; exports, $7,226,320,000, against the former high record of $6,290,048,000 in 1917; the grand total, $10,322,460,000, against the former high record of $8,949,404,000 in 1917. The excess of exports over imports or "favorable trade balance," was $4,129,000,000, against $3,630,639,000 in the former high record year of 1917. The favorable trade balance in the five years since the beginning of the war is greater than in the 125 years preceding the war. The gold imports in the last five years aggregated $1,823,000,000, and the gold exports $785,000,000, making the net importation of gold in the five years $1,038,000,000. The excess of exports of merchandise in the same five-year period was $13,963,000,000, this difference between net exports of merchandise and net imports of gold being largely offset by the Government's credits of $10,000,000,000 to our European allies.

LARGE PORTION OF CITIZENS INTERESTED IN UTILITIES.

Recent Statement Shows One-third of Illinois People Financially Affected by Utilities.

At a recent meeting of utility managers and operators held in Springfield, Ill., to lay plans for a closer co-ordination of effort in placing the after-the-war problems of utilities before the public the statement was made that 33⅓% of all citizens of Illinois, directly or indirectly have a financial interest in the public utilities of the state. The conference was held under the auspices of the Illinois Committee on Public Utility Information which has been created by the various associations of the combined utility industry of the state.

Speakers at the meeting declared that the ramifications of the industry are such that fully one-third of all citizens now have a financial interest, either as wage earners, security holders or through collateral industries dependent upon the utilities. Of the total of all citizens of the state, 193,700 are directly in the employ of the electric, gas, telephone, water, street and interurban railways or railroads and 153,600 others are employed in industries dependent upon the public utilities. These 347,300 wage earners, with their families, represent 1,736,500 persons dependent for their living upon the industry, or 17% of the entire population. In addition there are 230,000 security holders, who with their families total 1,150,000 persons, who are indirectly affected.

INVENTION CLAIMED TO INCREASE CONDUCTIVITY OF ALUMINUM.

Electrical men will be interested in the following submitted by United States Consul Philip Holland, of Basel, Switzerland, and published in *Commerce Reports* for Aug. 2:

"A new invention called conducting aluminum M. 277, which is said to be creating a profound impression, has been made by Dr. Georges Giulini, the most famous expert in the aluminum trade. This new metal is produced by putting the ordinary aluminum through a special patented process, by which it acquires the same mechanical qualities and capacities as bronze, copper, and brass without changing its specific weight.

"It is said that the price of the new metal can be kept within very low limits; so that, even at the prewar prices of other metals, it will be able, by reason of its smaller specific weight, to compete with copper and brass very favorably. The fact that the new metal is a conductor will make it especially in demand in the electrical trade. The inventor anticipates also a good market for it among the builders of motor cars, aeroplanes, ships, and railway carriages. Leading men, to whom the invention is already known, are said to be much impressed with its possibilities."

ELECTRIC UTILITIES IN JAPAN INCREASING.

It is stated that there are 715 electrical utility undertakings in Japan, including 625 power plants, 42 electric railways, and 48 companies operating both power plants and tramways. This is an increase of 40 companies over last year and evidences the growing popularity of electricity in that country.

Wireless Telephone Transmitter for Seaplanes

Light-Weight but Powerful Set Developed for Use by Navy's Flying Boats During the War

MARKED progress in the perfection of airplane wireless telegraph and telephone apparatus is a direct result of exhaustive researches in radio communication which have been conducted during the past two years. Light-weight transmitters having a sending range of 150 miles or more have been developed. Spark apparatus has been employed to a considerable extent in airplane communication, but transmitters utilizing the vacuum-tube oscillator have the advantage of permitting either speech transmission or telegraphic signals by damped or undamped oscillations, at the will of the operator.

Practical wireless telephone apparatus of the vacuum-tube type is disclosed in the following description of the Marconi type S.E. 1100 set—a comparatively high-power bulb transmitter—developed by the Marconi Wireless Telegraph Co. of America.

The set was designed primarily for the large flying boats, the H-16 class, of the United States Navy, and has fully satisfied every test to which it has been put. In one of the earlier tests in flight over Chesapeake Bay, telegraph signals radiated from a trailing antenna on an H-16 boat were heard distinctly in Washington, D. C., over a distance of 120 nautical miles. Subsequent tests with the set used as a wireless telephone permitted the accurate transmission of speech over a distance of 150 miles. The transmitter radiates at two wave lengths, 1600 and 600 meters. For the former wave length a trailing wire antenna of 0.0004 mfd. capacity is employed; for the latter, an emergency aerial of 0.00026 mfd.

The transmitter is supplied with two three-electrode tubes of the pliotron type. One tube is employed as an oscillator for the production of radio-frequency currents and the other as a modulator and amplifier of the voice currents communicated to it by the microphone.

The fundamental circuits of the set are shown in Fig. 1, the actual circuit in Fig. 2, a front view of the transmitter in Fig. 3, a rear view in Fig. 4, another rear view in Fig. 5, and a wiring diagram showing the function of the change-over switches in Fig. 6.

For best understanding of the operation of the apparatus, it should first be appreciated that if grid and plate circuits of a vacuum tube include radio-frequency circuits coupled inductively, conductively or electrostatically, alternating currents of any desired frequency may be generated. This is the first requisite; other problems, such as rapid change of wave length, satisfactory modulation and the elimination of disturbing capacities between circuits, arise in the practical set and are of equal importance. They were satisfactorily solved only after diligent research.

In order to set valve circuits into a state of radio-frequency oscillation, it is necessary that the connections be so made that the grid end of the grid inductance will be alternately negative and positive as the plate end of the plate inductance is positive and negative. When the grid and plate radio-frequency circuits are coupled with the proper phase relation, any variation of voltage in either the grid or plate circuits will cause minute disturbances in the oscillation circuits, setting them into oscillation at whatever frequency they happen to be adjusted to. For example, a slight variation of voltage in the plate circuit by any means whatsoever will cause its resonant circuit to oscillate at radio frequency, and the resultant currents will act upon the grid circuit, setting it into oscillation at the same frequency. The resulting radio-frequency fluctuations of the grid potential will act upon the plate at the right time to keep the plate resonance circuit in a state of oscillation, and this state of affairs will continue so long as the proper supply of voltage and filament current is maintained, but not otherwise.

The tube is able to generate alternating currents because of its amplifying properties. The energy delivered to the grid circuit in accordance with the actions just outlined will gradually increase in value until a maximum is reached, which is the maximum output the valve is capable of delivering, as may be discerned from the well-known characteristic curve.

Referring to Fig. 1, it will be observed that the plate and grid circuits of the tube contain the coils *L-1* and *L-2*, in inductive relation, each connected through the condensers *C-3* and *C-4* to the negative side of the filament. The grid oscillating circuit comprises the coil *L-2*, the condenser *C-2* and a protective condenser *C-4*. The plate oscillating circuit includes the condenser *C-3*, a part of the coil *L-1* and the series condenser *C-5*. The antenna and earth connections tapped off from the coil *L-1* take the place of the con-

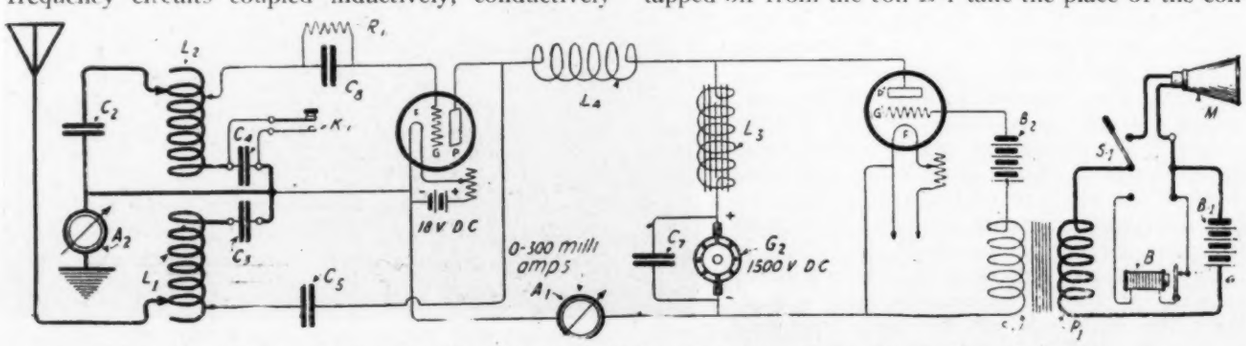


Fig. 1.—Fundamental Circuits of the Wireless Telephone Transmitter for Seaplanes.

denser *C-2* in the grid oscillating circuit. *C-2* is called the balancing condenser. In series with the grid is another condenser *C-8* shunted by a leak resistance *R-1*, which maintains the grid at a negative potential.

The system further includes a three-electrode tube *F'*, *G'*, *P'*, which amplifies the output of the microphone circuit and simultaneously modulates the output currents of the oscillating bulb.

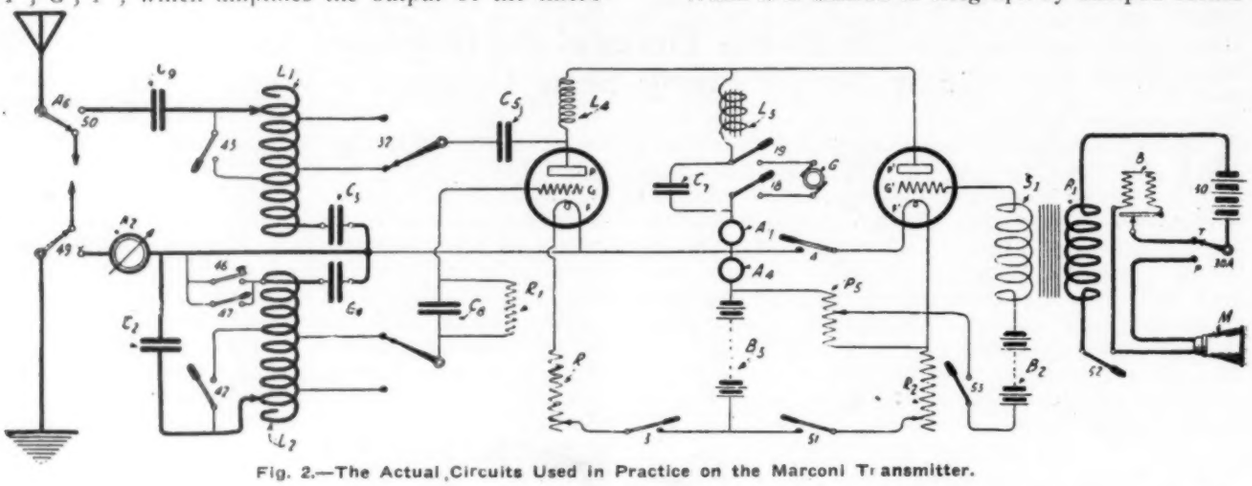


Fig. 2.—The Actual Circuits Used in Practice on the Marconi Transmitter.

It will be noted that the plate circuit is fed by a 1500-volt direct-current generator *G-2*, the positive terminal of which connects to the plate *P* of the oscillating tube through the audio-frequency inductance or transformer *L-3* and the radio-frequency inductance *L-4*. The negative side of the generator connects through the milammeter *A-1* to the negative side of the filament *F*. The condenser *C-5* is the protective condenser which is generally employed in tube oscillating circuits when the source to the plate circuit is connected in shunt to the plate and to the filament, as is the case in this circuit. The modulating circuit shown to the right of the drawing permits either voice transmission or telegraphy by damped oscillations.

For telephony, the microphone *M* is placed in series with the telephone induction coil *P-1*, *S-1* and the battery *B-1*, by means of the switch *S-1*. The coil *S-1* is connected to the grid and filament of the modulating tube and includes in its circuit the battery *B-2* through which the grid is held at a suitable negative potential for maximum magnification. The filament and plate of the modulating tube are shunted across the plate circuit of the oscillating tube. The audio-frequency choke coil *L-1* may be said to act as a one-to-one transformer. The radio-frequency choke *L-4* prevents the radio-frequency currents developed by the oscillator from flowing back to the plate-circuit generator *G*. *C-7* is protective condenser for the plate-circuit generator.

When the transmitter *M* is spoken into, speech currents of variable frequencies generated by the microphone are impressed upon the grid circuit of the modulating tube and, through the medium of the autotransformer *L-3*, alternating currents are superposed upon the plate circuit of the oscillator. This in turn varies the amplitude of the oscillator currents at speech frequencies, and accordingly the amplitude of the radio-frequency oscillations flowing in the antenna circuit. It is essential that the key *K-1* of Fig. 1 be closed for the production of undamped oscillations, for when it is open the tube stops oscillating. Manipulation of this key permits telegraphic signaling by the undamped oscillations produced by the tube.

When it is desired to telegraph by damped oscillations, the change-over switch *S-1* is thrown from the microphone to the buzzer *B* which is energized by the battery *B-1*. The interrupted currents fed by the buzzer through the primary *P-1* of the induction coil produce alternating currents of higher voltages in the coil *S-1*, which in turn are magnified by the modulating tube, the latter varying the radio-frequency currents in the oscillator tube at the frequency of the buzzer. In this way, the antenna radiates damped oscillations in groups, the frequency of the groups varying as the number of interruptions of the buzzer.

A more detailed circuit of the Marconi aircraft set appears in Fig. 2. This diagram not only embraces the fundamental connections of Fig. 1, but includes all necessary switches for the three different signaling

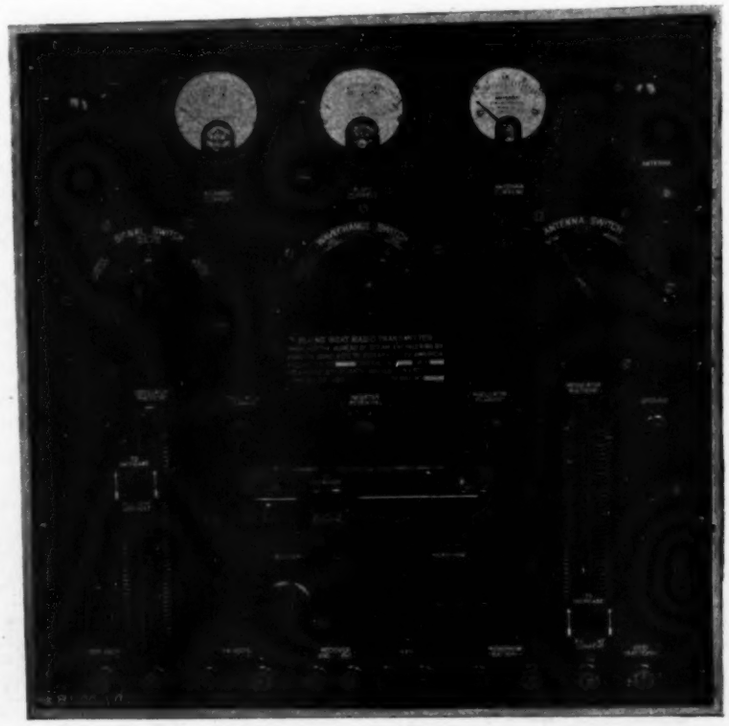


Fig. 3.—Front View of Marconi Wireless Set Used in Seaplanes.

functions on the 600 and 1600-meter wave. It includes, moreover, a detailed wiring diagram of the filament circuits.

The filament circuit divides at the positive terminal of the 24-volt storage battery *B-3*, one branch going through the rheostat *R-1* to the filament *F* of the oscillating valve, and the other going through the rheostat *R-2* to the filament *F'* of the modulating valve. The negative sides of the two filaments are connected together and to ground. In addition there is provided a potentiometer *P-5* connected across the battery *B-3* with a tap leading to the negative potential battery *B-2* and on through the secondary of the microphone transformer *S-1* to the grid *G'*.

The object of the potentiometer in Fig. 2 is to compensate for any loss of negative potential in the grid circuit *G'*, which may be occasioned by the lowering of the voltage of the filament battery *B-1*.

The switches for shifting the connections from one system of signaling to the other are enclosed in drums, as may be noticed in the left-hand part of Fig. 5. The inside and outside rows of jaws on each set are represented by the upper and lower group of dots in Fig. 6. In that figure the left-hand pair constitute the wave-length changing switch, the middle pair the sending and receiving switch and the right-hand pair the signal switch. The first, second and third positions of each switch are indicated by the letters *X*, *Y* and *Z*, these letters being placed between the two points which the blades of the switch short-circuit in that position.

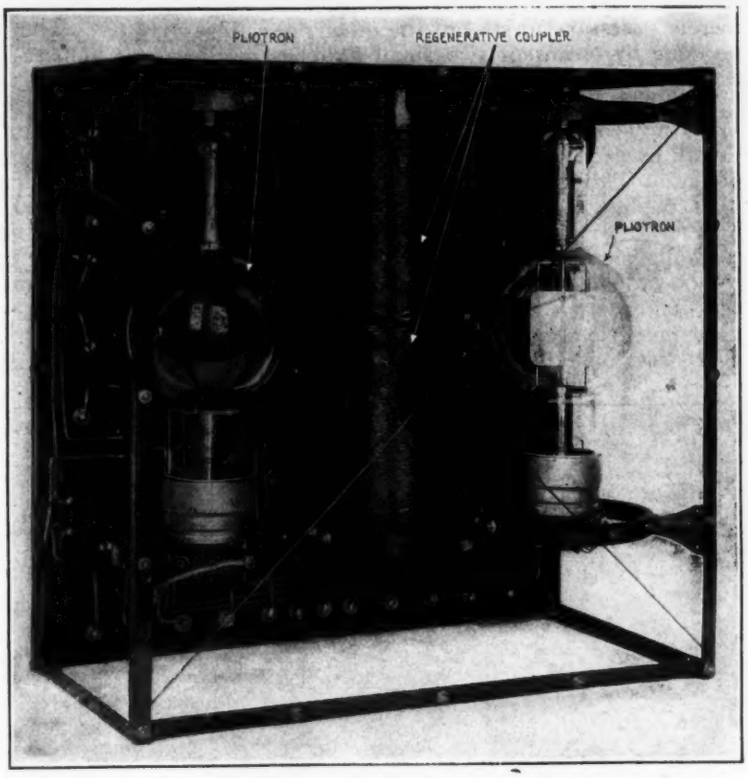


Fig. 4.—Rear View of the Transmitting Set With Pliotrons in Place.

Regarding the action of the oscillating valve itself it should be noted: When the grid is negative in respect to the filament, no current passes between the grid and filament; but when it is positive, considerable current passes which constitutes a loss in the circuit; but if the grid is held at a constant negative potential this energy loss is reduced and a more effective transmitter is obtained. The grid potential may be held at a negative value by the insertion of a grid battery but it can be done in just as effective a way by inserting a condenser in the grid circuit which rectifies the grid currents and holds the grid at a negative potential.

If the leak were not provided, the potential of the grid would rise to such a high negative value that all action would be stopped. A leak of proper value definitely limits the maximum negative potential of the grid and therefore does away with the necessity for a special grid battery.

The numbers on the separate single-pole switches in Fig. 6 correspond with those shown in Fig. 2. The outside row of studs on the wave-length changing switch perform the following functions: In the 600-meter position (*X* at *32* in Fig. 2) the first tap on the upper section of the loading coil *L-1* is connected to the plate series condenser *C-5*, and at *43* short-circuits the end portion of the same coil. In the 1600-meter position *Y*, it connects at *32* the second tap of the coil to the condenser and opens the short-circuit.

The inside row of studs on the wave-length changing switch performs the same functions for the coil *L-2*, which is the lower portion of the long single coil mounted in the middle of the rear of the panel in Fig. 4. In the schematic diagram, Fig. 6, the blade marked *35* is shown connecting to the first tap of the lower portion of the coil in the 600-meter position, and to the second tap in the 1600-meter position to the grid condenser *C-8* with its leak resistance *R-1*.

The outside portion of the switch marked "send-receive" (in the right-hand position of Fig. 3 and also in the upper central position of Fig. 6) serves to connect the antenna *A-6* to the transmitter in the "send" position (*X*) and to the receiver in the "receive" position (*Y*). In the "send" position the circuit of the antenna at *50* is through the series condenser *C-9* to the top of the loading coil *L-1* and to the ground. The latter is connected at *49* through the antenna ammeter *A-2* to the main ground bus of the set, which is the frame.

The inside portion of the "send-receive" switch, in the lower part of Fig. 6, is idle in the receive position *Y*, but in the "send" position *X* at *21*, it completes the 1500-volt direct-current supply current to the plates *P* and *P-1* of the pliotrons. At *52* it connects the primary of the microphone transformer *P-1* to the microphone terminals *28* and to the buzzer *B*. These connections are opened in the "receive" position.

There are three positions for the signal switch. The first *X* is for continuous wave telegraphy. In this position the connections made in the second and third positions are opened. The second position *Y* is for telephony; the inside portion of the switch (the upper part in Fig. 6) connects the microphone to the microphone battery, and at *51* the outside portion (in the lower part of Fig. 6) completes the filament circuit for the modulating valve and short-circuits the key at *47*. In the third position, the switch connects at *30-A* the buzzer to the microphone battery and at *51* keeps the filament of the modulating valve lighted, removing the short-circuit from the key.

Space and weight considerations demand the fewest possible measuring instruments. A direct-current ammeter *A-4* is connected in series with two filaments and reads the total current taken by both of them. The instrument's scale registers from zero to 10 amperes; to read the current in either filament it is

merely necessary to cut out the other one. This may be done by means of two small switches marked on the set "oscillator filament" and "modulator filament."

The principal indicator for checking up the proper operating conditions of the set is the plate current drawn by each of the valves from the dynamotor, the voltage of which, as already mentioned, is 1500 volts. This reading is obtained from the plate-current ammeter *A-1* of Fig. 2, connected in the ground leg of the supply circuit. This instrument reads from zero to 300 milliamperes and measures the total plate current taken by the oscillator and modulator. The maximum voltage developed by the dynamotor is 1600 volts and the vacuum tube generally will cease to operate when it falls below 1100 volts. The generating tube will oscillate over a wide range of plate voltage if the filament current is kept below a certain critical value. The filaments of the pliotrons are designed to operate on 18 volts.

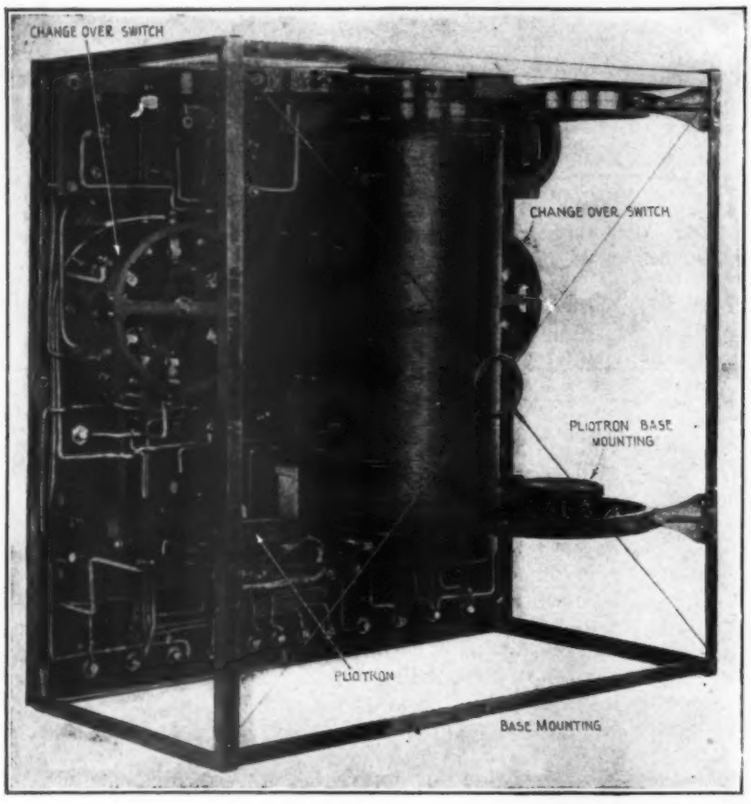


Fig. 5.—Rear View of the Set After Pliotrons Have Been Removed.

The entire set is wired with No. 12 B. & S. gauge bare soft copper wire with empire cloth tubing slipped over it as insulation. No terminal lugs are used; the ends of the wires are bent in the shape of an eye which fits the stud terminal and is passed around it in a direction that tends to make the wire grip the stud when the nut is tightened.

Owing to the vibration of the airplane every possible precaution has been taken to prevent the fastenings working loose. Special steel lock washers are used throughout the set. The general scheme of construction is such that the main supports and fastenings will bend before they break, wood or any material which splits or fractures having been eliminated. The steel wire cross braces shown in the rear views make the structure an extremely light and a surprisingly rigid unit.

The primary source of energy is two 12-volt, 50-ampere-hour storage batteries of the Willard lead type similar to those used in automobile starters. The filaments of the two pliotrons are operated through a rheostat directly from the 24-volt storage battery. Since the tubes require a plate potential of 1500 volts direct current, a small dynamotor, driven by the 24-volt storage battery, is supplied. The armature has two windings in the same slots, one connected to the 24-volt commutator at one end, and the other to the 1500-volt commutator at the opposite end. It is a two-pole machine excited from the 24-volt source. The armature, which runs on ball bearings at 5000 r.p.m. and draws about 30 amperes on its full load at 450 watts, weighs approximately 30 lb.

In addition to the 24-volt storage battery, three other batteries are required; two for the transmitter and one for the receiver. These three sets are known as the microphone battery, grid battery and receiver battery. The voltage of the first is 5; of the second 60, and of the third 40. The 60 and 40-volt sets consist of 20-volt units connected in series.

To insure against breakage, the best position for the pliotrons is vertical with the large neck at the bottom. This brings the plate-terminal cap at the top and the filament and grid-terminal cap at the bottom. In each of the two Dilecto rings shown at the top of Fig. 4, three spiral springs placed 120° apart support a spring cap which fits over the plate-terminal cap of the pliotrons. The springs are held by small machine screws which pass through the insulating ring. One of these serves as a terminal, being connected by a pigtail to the spring tap. In each of the two bottom Dilecto rings, three spiral springs placed 120° apart, support a special jack block made to take the filament and grid terminals. This block is made in two halves, upper and lower, held together by screws; clamping these spring jacks between them, three posts, which project from the bottom of the jack block, take the ends of the three supporting springs and are electrically connected by a copper pigtail to the screweyes that hold the other end of the spring to the Dilecto ring. The two filament terminals of the tube and the grid terminal are brought out to the three screws in the Dilecto ring. Thus, each pliotron is supported to the rigid frame of the set by six springs which are set so that when the tube is in place the top springs pull down and the bottom springs pull up.

The mechanical period of vibration of the vacuum tubes in this spring mounting is considerably below that of any vibration that will occur in the seaplane itself. Sudden shocks in any but a horizontal direction are not transmitted through these springs with sufficient violence to injure the tubes.

The antenna reel group for this set consists of the reel mechanism, a removable drum with antenna wire and spare drums with complete antennae on them. The wire from the reel runs through a take-off pulley and passes through the lead-in insulator in the side of the hull of the boat. It then passes through either a strut pulley or wing pulley, depending upon the type of the boat.

A cast aluminum plate, clamped to one of the main

struts in the hull of the boat, carries a shaft on which the drum turns. On this same shaft, next to the attachment plate, there is a brake drum of cast aluminum and around this drum a cast-iron brake band. The band is sprung over the drum and prevents it from turning except when a cam which is attached to the brake lever springs it open. A pin on the brake drum engages holes in the main drum, when the latter is put on the shaft. The crank by which the main drum is turned has a square hub on which the drum sets. It is slipped onto the shaft and latches in place. The latch is released by a latch handle just behind the arm of the crank. To remove the drum, to put a new one in place, the operator grasps the arm of the crank, and in so doing also grasps the latch handle and releases the latch. He then pulls the crank and drum off together. One drum may then be slipped off the hub of the crank and a new one put on, and the two slipped back onto the shaft.

The drum is a pressed-steel spool, black japanned, and will hold about 600 ft. of the standard antenna wire. It has a square hole at its center which fits the hub of the crank. The antenna wire has a ball at the reel end and this ball is dropped through a hole in the drum face. The other end of the wire is attached to a swivel, and this in turn is attached to the "fish" or weight.

The lead-in insulator is a molded Electrose fitting, with a metal tube running through it, and a wide flare at either end, so that the wire cannot catch on the ends of the tube even if it enters at right angles. The insulator is held by locknuts in a hole in the side of the hull. The antenna connection from the set is brought to this insulator. When the antenna is out, the ball on the reel end of the wire rests against the inside flare of the insulator. The wire is thus entirely disconnected from the reel, and the reel is dead. When it becomes necessary to reel up, the ball is grasped and of course brings the wire with it. The ball is passed through the take-off pulley and dropped through the hole in the drum face, and the crank is turned. The brake mechanism is arranged so that the cam may be left holding the brake off during the reeling-up process.

The maximum antenna current is 2.5 amperes, with the antenna supplied with the set. This has been found to satisfy all ordinary distance requirements.

Comprehensive instructions are supplied with each set, enabling the operator to obtain the best adjustment for the three signaling positions with the greatest ease.

SQUARE DEAL TO UTILITIES, THEIR EMPLOYES AND PUBLIC.

In a recent interview on high prices and the general business outlook, Britton I. Budd, president of the Metropolitan Elevated Railway Co. and head of the Chicago Elevated Railways, said:

"We hear a good deal of talk about prices again becoming 'normal' Such talk results from a lack of understanding of what constitutes a 'normal' price of a commodity or a 'normal' wage of labor. If by 'normal' is meant the prices and wages of, say, 1914, I do not believe we shall ever again see such prices and wages, and we should at once begin squarely to face the facts. In my judgment the tendency is toward higher prices and wages.

"As I view it, a 'normal' price is a price based upon the cost of production, so that what was a fair price for a commodity in 1914 is not a fair price in 1919. The same is true of wages for 'normal' wages in 1919 must be based upon what it costs the worker to live according to American standards and allow a reasonable margin for the inevitable rainy day.

"We are entering upon a new era. The future must bring a square deal for labor, a square deal for the public and a square deal for the public service companies, which are now being starved to death for lack of nourishment."

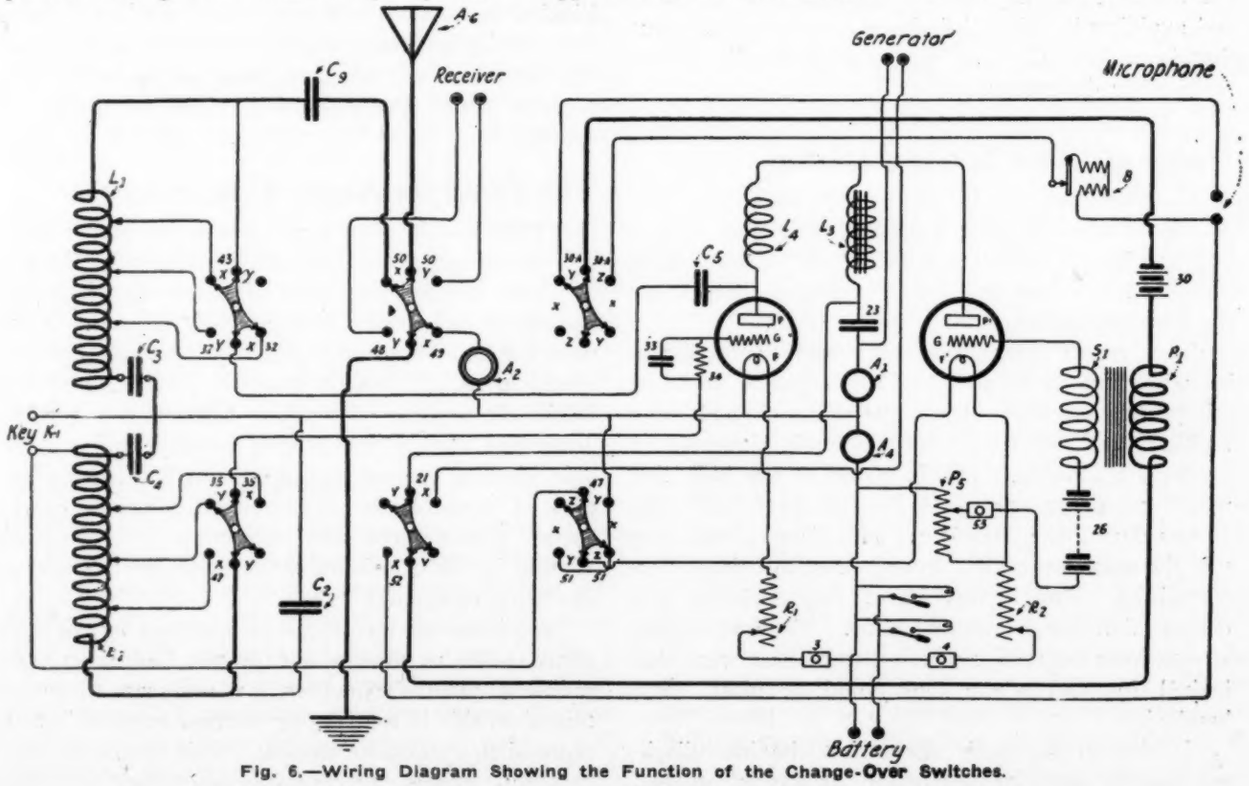


Fig. 6.—Wiring Diagram Showing the Function of the Change-Over Switches.

Editorial Comment

Another Step in Co-operation

ANOTHER big improvement in the conditions in the electrical industry was made recently when the manufacturers of outlet boxes, covers and similar supplies adopted a standard system of numbering their products for catalog purposes. In doing this these companies have evidenced their progressiveness and willingness to co-operate with the rest of the industry and it therefore behooves all others interested in these fittings to familiarize themselves with the new numbers as quickly as possible and use them exclusively when ordering or referring to them. There is no doubt but that the proper use of the new numbers will effect a considerable saving and be much more convenient to all concerned and at the same time enable architects and others not connected with the electrical industry directly to become more familiar with such fittings and their uses.

The most striking feature, however, is that this action marks another step in the advance of the electric industry along co-operative lines. It represents another case of one branch of the industry expressing a desire to assist the others and accepting their suggestions. There are, of course, other factors in our business that need to be adjusted, some perhaps more important than this, but as long as we proceed in this manner, working together for each other's benefit and avoiding individual strife we need not worry but that in a short time we will succeed in eliminating these other difficulties.

Value of Good Street Lighting

IT HAS come to be quite common to say that good street lighting is the best policeman, it having been found that where there is ample light there is less crime and fewer accidents than where the illumination is sparse.

The recent lamentable race riots in Chicago brought home to the writer of this editorial, while on militia duty for over a week, the value of good street lighting and, inversely, the objections inherent in inadequate lighting. Things go on in the dark that would not occur nor could they persist in the light. It was during the dark hours of Chicago's race riots that the most serious and most numerous crimes were committed. And it was where the darkness was densest that the worst was done. The well lighted streets were the streets where disturbances were least looked for and where they could be most easily handled.

It was in the dark alleys that the incendiaries traveled the paths of destruction. It was in the shadows and the densest masses of gloom that the snipers did their deadly work. These things are expected and proved by experience. The difference between the dark and the light street was such that in most cases, for similar conditions, double the number of militia or police were required in the dark or inadequately lighted terraine that sufficed where the streets were well lighted.

What has been said—that ample street lighting is far superior to insufficient lighting on the score of safety and law and order—is quite self-evident. But what was found true in the time of riot is also true in normal times. The well lighted neighborhood needs less policing than the neighborhood where the lighting is deficient. The investment in street lighting is a good investment when balanced against the police payroll.

And there are many other items on the credit side of the street-lighting cost—items difficult to valuate because less tangible but none the less real—chiefly all that goes with safety and law and order. Moreover, there is the increased value to the property owner of having his residence or place of business on a bright and cheerful street instead of on a dark, gloomy and dangerous one. And to the city at large good street lighting accounts for much of the difference between attractive and repulsive streets. Finally, at small cost, it may save a city's reputation from being suddenly besmirched with a stain that its authorities and the great mass of its law-abiding citizens would gladly have avoided, regardless of expense.

The Field for Static Condensers

POWER-FACTOR correction is one of the measures offering the greatest opportunity for the central stations in the way of economies of fuel, of equipment and lines. With the war came the urgent need for improving the power-factor because doing so meant increased capacity available for useful service. While the urgency of utilizing equipment to the best advantage, that is, by reducing needless and preventable wattless current, has somewhat abated, the benefits of power-factor improvement remain. Power-factor improvement and correction are, therefore, coming in for considerable attention on the part of operating companies.

Better power-factor can be obtained by the judicious choice of motors and proper loading in many industrial plants. However, it is necessary to go further than this if the lagging wattless current is to be reduced to a desirable amount. This means that synchronous motors, synchronous converters and static

condensers are finding increasing application in industrial load centers.

The field for the synchronous converter for power-factor control is rather limited, as is well known, and the synchronous motor and the static condenser only are available for general application. It is only of comparatively recent date that the static condenser has found favor, it having come into commercial usage in this country only quite recently. It has been employed in Europe, however, for a somewhat longer period and with satisfactory results.

The chief objection to the static condenser is that for a given frequency and applied voltage the power-factor, hence the leading current, is a fixed quantity. This means, of course, that the static condenser will improve low power-factor but cannot correct it by varying the wattless current component. This shortcoming of the static condenser eliminates it from consideration in certain classes of service, but really is not a very serious drawback in other instances. For example, if the average power-factor of an industrial load center is 65% and the installation of a static condenser enables the average power-factor to be raised to 90%, the fact that adjustable gradations cannot be readily obtained is really immaterial. It is a case of power-factor betterment as contrasted with power-factor control or voltage regulation. For the former the static condenser may be the solution; for the latter the synchronous condenser is the solution.

Experience seems to show that for installations up to about 1000 kv-a. where power-factor betterment is sought, the static condenser may be preferable to the synchronous condenser. Power-factor betterment is obtained without human attendance or supervision; once the condenser is installed it can be forgotten so far as concerns operation. The efficiency of the static condenser is higher than that of the synchronous condenser and the cost more and more in favor of the former.

There is no doubt but that the static condenser meets a certain condition admirably. This condition is quite general but the suitability of the static condenser is not generally appreciated to the same extent as is its unsuitability for certain purposes. For power-factor betterment up to, say, 1000 kv-a. in localities remote from personal supervision the static condenser is deserving of most careful consideration.

Return of the Wires

TELEGRAPH and telephone wire systems of this country have been released from Government operation, the change having taken place at midnight of July 31. From this time we predict gradual but noticeable improvement in both these classes of service. During the year of Government control, due to unavoidable conditions growing out of the war, both equipment and trained personnel were greatly depleted. Now that the men are steadily coming back from service overseas and equipment tied up for war service is being released, we believe there will be steady improvement in service to at least the standards formerly prevailing.

The two big telegraph companies, the Western Union Telegraph Co. and the Postal Telegraph-Cable Co., both have announced to the public through their presidents return of their properties to the management of the owners, and the latter company states its rates will be reduced 20% to the point where they were before the Government assumed control.

In the telephone industry, as represented by the Bell System, the announcement of the change and all that was involved during the past year was made substantially as follows:

"A year ago today we were at war. Labor and materials needed for both telephone operation and construction were turned to military uses. Some materials were so vital to the carrying on of the war that even the work of providing telephone facilities for the Government was retarded and no part of them could be spared for commercial telephone purposes. No less vital was the Government need for those skilled to create, maintain and operate the vast intercommunication system necessary in modern warfare and in the conduct of the vastly increased Government services. Thousands of telephone men were already at the battlefront. Thousands more were under arms, and still telephone experts and skilled operators went into the service of the Government and contributory industries by the tens of thousands. The reserves of plant and equipment were drawn upon until they were entirely used up, and the experienced staff was gradually depleted. To find others to take the places of those who had gone was difficult, to train them takes time. During the year came victory and the armistice; and instantly the business world sprang into intense activity. The demands for telephone service passed all former records. To replace the exhausted reserves which had been carried for just such purposes and to replace the skilled forces to meet this unprecedented emergency, there began a rush for construction, for readjustment, for high-pressure repairs, for feverish extensions. All these must be continued with increasing effort. * * * There are no people in any public or private endeavor who are working more tirelessly or strenuously for the common good than those of the telephone companies. Service has always been given. More of it must be given, and it must be improved. That improvement in some cases will take months. Eventually service must win the race with demand."

Before the war's demands crippled the telephone service, as well stated above, the telephone organization was satisfactorily and efficient managed. We believe the change that has now taken place will soon show a very decided and comprehensive improvement. A little patience is required on the part of all the public while the present conditions are being remedied.

Current Events

Outlet Box Numbering Standardized—Meeting a Transportation Emergency—Michigan Convention Dates Changed

OUTLET BOX MANUFACTURERS ADOPT STANDARD NUMBERING SYSTEM.

New Method Offers Many Advantages to Jobbers and Contractors in Ordering.

As further evidence of their progressiveness the group of the Associated Manufacturers of Electrical Supplies manufacturing outlet boxes recently adopted a standardized system of numbering for outlet boxes and covers. This action is the result of a suggestion made some time ago by the Electrical Supply Jobbers' Association. At that time, due to war conditions, it was not possible to make these changes. Now, however, a method of making these changes has been decided upon and new catalogs will shortly be on the market bearing the new standardized catalog numbers. Hereafter the trade will have but one number to consider as substitute numbers and cross-indexing will be eliminated. A catalog number will mean a certain definite box and this number will apply to this same box made by every manufacturer.

The method adopted is very simple and clear, there being no key to remember and no puzzles to clear up. As an evidence of this, the numbers have been so worked out that the first two numerals of the cover for a certain size and shape of box, will be the same as the first two numbers of the box itself. The box number will consist entirely of numerals. The cover will be designated by the insertion of the letter "C" after the first two numerals. The flush plate will be designated by the insertion of the letter "R" after the first two numerals.

A few of the reasons for the standardization of box numbers and the advantages to be derived from it, follow:

1.—There are at present approximately 1500 different numbers used in designation of boxes and covers of various manufacturers. There are, however, less than 200 distinct types.

2.—Each manufacturer now has his own system of numbering, although the use and general type of almost any box or cover is identical with that of several manufacturers.

3.—Both contractors and jobbers, in placing orders, rarely, if ever, take the trouble to look up and use the numbers of the manufacturer with whom the order will be placed. This necessitates the editing of orders by either the jobber or manufacturer and necessarily results in numerous errors. On orders received from contractors, the jobber will often substitute the numbers of such boxes as he may have in stock, for those specified on the order, if shipment is to be made from stock, or, in case direct factory shipment is to be made, forward the order as received to the manufacturer with whom he may be placing his box orders at that particular time. This is invariably done unless the purchaser insists upon the particular make of boxes specified.

4.—The types and styles of boxes and covers have become so standardized as to be almost on the same basis as sizes of conduits. There is, therefore, no more reason why different numbers should be used to designate the same box as manufactured by different manufacturers than that different numbers should be used to designate the sizes of conduits.

5.—With the various box manufacturers using separate numbering systems, it is now necessary for the device manufacturer to use as much space in listing the boxes or covers with which their receptacles, switches, attachment plugs, etc., may be used as to list the articles themselves. This is also applicable inversely; about as much space is used in the catalogs of the box manufacturers in listing the devices as in listing the boxes and covers themselves. Then, again, it is the almost universal custom of the various box manufacturers to list the corresponding numbers of competing manufacturers. To do this requires additional space.

6.—For the box manufacturers to furnish the device manufacturers with the necessary data for a proper listing involves an enormous amount of detailed research work for the design, engineering and drafting departments of each. Also voluminous correspondence and consequently errors are frequent. Both labor and errors will therefore be reduced to a minimum by a standardization of numbers.

7.—If the various manufacturers adopt a standard set of numbers it will effect a considerable economy in catalog costs, and, in addition, reduce the volume of jobbers' catalogs. Separate sheets are now issued by the National Electrical Supply Jobbers' Association, to show the lines of the several manufacturers. By the adoption of a standard set of numbers, these could be consolidated and one set of sheets used to show the lines of all manufacturers. This would reduce the volume of the association catalog by from 100 to 200 pages. The same would apply to the data sheets issued by the National Association of Electrical Contractors and Dealers.

8.—The reduction in the volume of sheets would be particularly appreciated by jobbers' salesmen, as it would considerably reduce the weight of the catalogs which they have to carry.

9.—A jobber, in getting out a new catalog, would feel no hesitancy in listing a standard set of numbers, cuts, etc., for they could be so listed and his orders placed with any manufacturer. At the present time jobbers are frequently carrying the listing of one manufacturer's line and furnishing boxes of some other manufacturer.

10.—Separate numbering systems, as now used, give recognition to substitutes, which, at best, is a bad practice and not to be encouraged. For if encouraged in one line, as at present in the outlet box line, leeway is allowed for substitution in all lines.

11.—The adoption of a standard numbering system would prove educational to all in the electrical

business, for contractors, salesmen, wiremen, clerks, etc., would soon become familiar with any system adopted and know that an XYZ box was a box of a particular type and for a certain use. With many different numbers, as is now the case, this is impossible.

12.—While some advantage might now accrue to the various manufacturers through familiarity of portions of the trade with their own "pet" numbers, the adoption of a standard set of numbers would prove reciprocal, and each manufacturer would benefit in about the same proportion.

13.—The adoption of a standard set of numbers would in no way interfere with the various manufacturers playing up the strong points of their own lines, such as finish, detailed construction, materials used in manufacture, etc. As a matter of fact, these features could be emphasized more than is now possible. In ordering, a contractor, if he wanted some particular make of box, could specify by giving the name or brand and then list the standard numbers desired. As indicated in a previous paragraph, this would reduce substitution to a minimum, eliminate frequent errors, etc. If no particular brand was specified, jobber would, of course, understand that no preference existed, and could ship from his stock or place the order for direct shipment with his preference of manufacturers.

CHICAGO CENTRAL STATION MEETS TRANSPORTATION EMERGENCY.

Commonwealth Edison and Other Companies Find Electric Truck Useful in Recent Tie-up—Terms of Settlement.

The recent four-day strike of the elevated and street car men in Chicago resulted in a complete tie-up of the transportation facilities of this city and was rendered even more confusing inasmuch as it was entirely unexpected both by the public and the companies. In this emergency the officials of the various industries had to act promptly if a great industrial shutdown was to be avoided. This was done however in the vast majority of cases with the result that aside from a little confusion and annoyance practically all concerns carried on business as usual.

Prominent among the Chicago companies whose prompt efforts in transporting its employes to and from their work was particularly noticeable, was the Commonwealth Edison Co. As soon as the news of the strike became known, which was not until early Tuesday morning, the officials of that company began making their arrangements, and in a few hours had 11 automobiles on duty transferring its station operators and other station employes to the stations and to their homes.

During that same day arrangements were completed for taking care of the company's other employes. Ten routes were laid out covering practically all of the city except those parts that could be reached by train service and 30 electric trucks were assigned to these routes. Those employes who did not live near the railroads were given passes that entitled them to ride on the trucks. The trucks were fitted up with benches and seats to make them more comfortable and to permit as many as possible to be carried at one time. The average number of passengers carried on one truck was about 30 but as many as 50 were loaded onto some of them.

As the "loop" section of the city on this day was badly congested the trucks were started from points outside of this district. This congestion was considerably relieved on the second day, however, and after the first evening the passengers were carried directly to the main office of the company located at 72 West Adams street. Each truck was started at a certain time in the morning from a given point where the various employes living in that neighborhood congregated. Other employes were picked up at various points en route. In the evening the trucks were loaded at the Edison building and carried home.

The operation of the electric trucks in this emergency is especially noteworthy. Although the usage to which they were subjected was particularly severe no serious difficulties were encountered. Of course the excessive mileage they were forced to cover necessitated numerous boosting charges, but a little extra attention given to this phase of their operation eliminated any difficulty in this respect. In addition the passengers were carried much more comfortably than on the improvised gasoline buses and due to the congestion which necessitated frequent stopping, the speed was also equal to that of the gasoline vehicles.

Employes of Commonwealth Edison Co., Chicago, Use Company's Electric Vehicles for Transportation During Recent Traction Strike.

Many other large Chicago concerns, notably the department stores, used their electric trucks to good advantage during this time. No bad results were noticed from the hard usage.

At this time it might also be of interest to state briefly the terms by which the strike was concluded. The strike was called at a meeting on Monday night which was controlled by a radical element of the unions and at which a compromise offer suggested by Governor Lowden was rejected. Friday, however, a vote of the entire membership was taken which resulted in its acceptance.

The compromise offer provides for a maximum wage scale of 65 to 67 cents an hour on the basis of an 8-hour day, with time and a half for overtime. The increased expense to the traction companies will be met by an increase in fares authorized by the Public Utilities Commission of Illinois. This order permits the Chicago Surface Lines to increase its fares 2 cents, making the fare 7 cents, and the Chicago Elevated Railroads a like amount making its fare within the city limits 8 cents.

GOVERNMENT ASKED TO REDUCE ITS USE OF CABLES.

Public Ownership of Commercial Wireless Opposed by Foreign Communications Committee of National Foreign Trades Council.

The National Foreign Trade Council's committee on foreign communications, at a recent meeting, declared strongly in favor of the establishment and maintenance of adequate systems of transoceanic communications under private enterprise and for the speediest possible release of Government control of such private commercial systems as have not already been returned to their owners. At the same time the committee took measures looking to the early establishment of additional means of communication across the Pacific so as to bring to an end as promptly as possible the present intolerable conditions in transpacific cable and wireless communication.

The committee went on record as definitely opposed to Government ownership, control or operation of commercial systems or cable or wireless in time of peace; but pending the return to private operation of such commercial systems as are still under Government control, the committee favors the continuance of the Naval Radio stations in commercial service, in order to afford as much relief as possible from present conditions, especially across the Pacific.

One case reported to the committee was of the receipt of a cable from China that was 12 days old. Another case showed a delay of one month in closing a single transaction, owing to the necessity of repeating a message, mutilated as well as delayed in transmission. It was brought to the attention of the committee that there is a tendency in different Government departments to use cable or wireless at times for communications more or less routine in character and that such traffic increases the delay in transmission of commercial messages that are essential to the transaction of important international business.

The committee is calling this situation to the attention of the President and to the heads of various Government departments with the request that the volume of Government business which now takes precedence over all commercial business shall be reduced as far as practicable, and that Government messages which are not urgent should be transmitted without the right of precedence over commercial business. The committee will also ask the Government to call the attention of other governments to this situation and urges that they take similar measures in the interest of international commerce.

DATE OF MICHIGAN CENTRAL-STATION MEN'S CONVENTION CHANGED.

Program of Meeting to Be Held at Ottawa Beach, Aug. 26, 27 and 28.

The dates originally set for the next convention of the Michigan Section of the National Electric Light Association, Aug. 19 to 21, have been postponed to the corresponding days of the following week, Tuesday to Thursday, Aug. 26 to 28. This change was made necessary by the large number of members and guests desiring to attend the meeting. The Hotel Ottawa, at Ottawa Beach, Mich., where the convention is to be held, could not accommodate so large a number along with its regular summer guests until the last week in August. Reservations should be directly with the manager of the Hotel Ottawa and as soon as possible.

An interesting program covering all phases of central-station business has been arranged as follows:

The convention will open on Tuesday morning with an address to be delivered by the president of the section, Thomas Chandler, of Sault Ste. Marie. This will be followed by an address on the "New Public Utilities Bill" by James V. Oxtoby, Detroit. Two papers will then be read, one by John Swanson, Consumers Power Co., Jackson, on "More Favorable Policies Toward Consumers," and R. A. Gordon, of the Houghton County Electric Light Co., on the "Central Station and the Contractor-Dealer."

In the afternoon J. F. Mayo, of the Consumers Power Co., and H. H. Magdsick, of the National Lamp Works of General Electric Co., Cleveland, will read papers on commercial and industrial lighting, respectively.

A special session has been arranged for the evening of this day at which Harry Burton, of the Consumers Power Co., will deliver an address on safety and resuscitation, and W. A. Durgin, of Chicago, will present a lecture and demonstration on industrial illumination. Both of the talks will be suitably illustrated and in addition a moving picture, "Queen of the Waves," showing the progress of electricity in navigation, will be shown through the courtesy of the General Electric Co.

The speakers for Wednesday are as follows: A. H. Touscany, Detroit Edison Co., on "Appliance Sales in Detroit Edison Co.'s Suburban District"; H. H. Koelbel, Consumers Power Co., "Electrical Merchandising"; E. J. Copeland, Kelvinator Corporation, Detroit, "Domestic Refrigeration"; R. F. Hetton, Detroit Edison Co., "Electric Ranges, Their Sale and Operation."

In the evening a special entertainment program has been arranged at which F. G. R. Gordon, Haverhill, Mass., will speak on "Municipal Ownership."

On Thursday, J. H. Lobben, Detroit Edison Co., and J. A. Cavanaugh, Benton Harbor, will read interesting papers.

Herbert Silvester, Monroe, Mich., is secretary of the association.

ACTIVITIES OF NATIONAL LAMP WORKS ENGINEERS.

S. E. Doane, chief engineer of the National Lamp Works, of General Electric Co., Nela Park, Cleveland, Ohio, presented a paper before the sales managers of the Association of Edison Illuminating Companies at Association Island on Aug. 4, on the subject, "The Incandescent Lamp from the Manufacturer's Standpoint."

G. S. Merrill, assistant chief engineer, National Lamp Works, has been appointed chairman of the Illumination Committee of the Ohio Electric Light Association.

E. J. Edwards, electrical engineer of the National Lamp Works, was in Buffalo the week of July 28 to conduct an investigation of air and steam transmission at the plant of the Puritan Refilled Lamp Division.

H. H. Magdsick, of the Engineering Department, National Lamp Works, will present a paper on "Practical Phases of Industrial Lighting" at the convention of the Michigan Section, National Electric Light Association, at Ottawa Beach, Aug. 26 to 28.

Commercial Practice

Central Stations Show Big Load Increases—Appliance Sales Improve in South — Pittsburgh Company Reduces Rates

NORTHERN ILLINOIS COMPANY'S LOAD GROWING RAPIDLY.

Public Service Co. of Northern Illinois Also Actively Conducting Appliance and House-Wiring Campaigns.

According to present indications there is no doubt but that the year 1919 will be a notable one in the power development of the Public Service Co. of Northern Illinois. At the beginning of this year it was estimated that the probable increase in power load during the entire year would be 17,000 hp. According to the *Public Service Lumen,* the house-organ of the company, the increase during the first six months of the year has been 14,937 hp., or roughly about 2200 hp. less than the total allotment, with six months still to go. The increase from May 31 to July 5 was over 4500 hp.

The large expansion of many plants in the booming industrial districts surrounding Chicago and extending north to Waukegan and south beyond Joliet as far as Kankakee to a considerable extent, is accountable for the increase noted. But that is by no means the sole cause. Many new customers—new plants beginning operations and other hitherto unprovided with electric power—have created a demand which works into large figures. As compared with the corresponding period of 1918, the increase is over 100%. For 1917 the figures were 9806 hp. The following table is an analysis of the six months' record of 1919. It includes, as seen, the load created by electric ranges:

TOTAL CONTRACTED POWER BUSINESS.

Jan. 1, to July 5, 1919.

Div.	Customers.	H.P.	1919 Allotment.
A	43	4,080.8	3,000
C	93	636.7	2,000
D	121	2,266.7	3,000
E	30	143.6	500
F	43	4,312.7	3,000
J	64	2,166.9	3,000
K	31	262.5	1,000
L	25	134.5	250
O	17	106.6	100
R	10	139.1	150
S	21	181.8	1,000
	498	14,331.9	17,000
Ranges	62	605.5	
Total	560	14,937.4	

Among the late contracts made is one for 790 hp. additional made by the Elgin, Joliet & Eastern Railroad for use in its shops at Joliet; one with the Vitanola Talking Machine Co. at Cicero for 700 hp., one with the Coonley Manufacturing Co., also at Cicero, for 250 hp., and one with the Parrett Tractor Co., at Chicago Heights, for 380 hp. The Construction Materials Co., at Waukegan, engaged in construction work, contracted for 600 hp., and in Cicero the same concern became the user of 50 hp. The Arcady Farms Milling Co., at Riverdale contracted for 500 hp. to operate its large mills. At Chicago Heights the Calumet Steel Co. made a contract for 100 hp. and at Waukegan the Cyclone Fence Co. signed for 137 hp. additional. The Mueller Construction Co. at Cicero contracted for 50 hp., the Superior Chemical Co. at Joliet for 73 hp. additional, the Towns Elevator Co. at Evanston for 70 hp., the Macey Construction Co. at Clearing for 50 hp., the Magazine Circulation Co., Chicago Heights, for 60 hp., and E. J. Butler & Co., at Riverdale, for 70 hp.

The electric range figures are especially interesting. These appliances present so strong a case of their own that the favor with which they are received by the public is steadily increasing. In a comparatively short period 48 new range customers were added. In the week ending July 5, ranges disposed of represented a demand of 25 hp. No attempt is made to push this device in territory where the company supplies gas but considerable success has been achieved in the sale of electric ranges in the resort districts served by the company.

The increase of new business in house-wiring is also impressive. Up to July 1 the total number of houses equipped so far in the year was 969. An increase of more than 200% is represented in these figures compared with the same period of 1918. Division "J" leads the procession with 287 houses connected up. Division "C" comes next with a score of 165. Division "A" is third, its total in the report being 147 houses. Division "D" is fourth with 132 houses. Of the whole number of houses wired the owners of one-third declined to take advantage of the easy installment privilege and paid for the improvement in cash. In all the towns in the territory a close co-operation between the company and local contractors was secured and the latter's business was benefited by the company's liberal advertising. The contractors' work is not included in the above figures. In the period referred to they wired in all parts of the territory a total of 470 houses.

In addition household electrical appliances are moving out in much larger volume than last year. The record for the first six months of 1919, in fact, is in its way as notable as that made in the contracted power business of the company. The greatest demand is for labor saving appliances—irons, washers and vacuum cleaners. Throughout the smaller towns where no office is maintained, 50,000 circular letters were sent recently to customers offering an electric iron or an electric toaster on a 10-day free trial, payment for either appliance, if the user elected to keep it, to be made in small installments monthly. The response to this offer has been excellent.

The company's Sales Department is also co-operating with the Edison Electric Appliance Co., of Chicago, in the latter's campaign among the educational institutions throughout the country to encourage the use of electrical appliances in the home. Various circular letters have been sent out to the instructors

of the Domestic Science Departments of the schools in the territory served by the company and its sales force is taking every advantage of this opportunity.

GREATER DEMAND FOR ELECTRIC APPLIANCES IN SOUTH PREDICTED.

Increasing Scarcity of Colored Help Results in Greater Use of Electric Labor-Saving Devices.

Largely increased sales of labor-saving electric household appliances are predicted through the South, where the domestic labor situation has taken on more of the aspects familiar in the North. Conditions in Louisville, for example, have changed radically in the last three or four years, according to Robert Montgomery, manager of the Commercial Department of the Louisville Gas & Electric Co., Louisville, Ky. "When I first came to Louisville," says Mr. Montgomery, "negro servants were so plentiful and could be employed at such low prices that it did not pay the housewife to do much of the hard work, but today you find servants difficult to obtain and they are now demanding prices such as paid for labor of this kind in Chicago. It is a condition entirely new to the Southern people, who have never before experienced difficulty in securing cheap domestic help."

In line with the increased use of electrical household appliances, the Booker T. Washington community center at Louisville is teaching negro women how to use these devices. A circular describing the course of instruction at this institution says: "The world keeps moving forward all the time. We must all keep up with the times. If we do not we lose in comfort, convenience, time and money. The man or woman who studies and learns to use the new way of doing things and the new inventions is the one who gets ahead in the world, makes the most money and has the largest amount of leisure."

DUQUESNE LIGHT CO. REDUCES RATES FOR RESIDENCE SERVICE.

Lower Rates of Pittsburgh Company Expected to Stimulate House-Wiring Campaign.

A reduction in the rates for residence service amounting to approximately 20% was put into effect July 1 by the Duquesne Light Co. of Pittsburgh. The new rate provides for a charge of 8 cents net per kw-hr. for the first 30 hours' use of maximum demand in any month. The next 60 hours of demand will be charged for at the rate of 6 cents per kw-hr. and all current consumed in excess of this amount in any month will be charged for at the rate of 3 cents per kw-hr.

The maximum demand for such service will be determined by the number of lamp outlets on the following schedule: The first 10 lamp outlets are rated at 300 watts; the next 20 lamp outlets are rated at 20 watts each; lamp outlets in excess of 30 are rated at 10 watts each. Every lamp socket excepting those contained in portable and floor lamps is counted as a lamp outlet, as well as all baseboard, floor and similar outlets. The service charge residential rate schedule remains unchanged.

In order to apply this new rate, it was necessary to take a census of the lamp outlets for every residential installation now on this schedule, approximately 65,000. For this purpose a staff of 60 census men was organized and began work on June 23. It is anticipated that this census will be completed within 90 days.

Reductions were also made at the same time in the wholesale power rates for the company but these were much smaller than those made in its residential service. These changes will effect the energy charges only.

Coincident with the house-wiring campaign being conducted by the company, these liberal reductions in its residence rates should bring about an enormous addition to its residence consumers. In the early part of this year the Wiring Department of the company, under the supervision of Howard H. Wood, started a campaign to secure the wiring contracts for 2000 old houses by July 1. This campaign was very successful, 2065 contracts being secured in Allegheny county and 325 in Beaver county during this period. With the impetus afforded by the reduced rates, the campaign period has been extended and a new mark of 5000 house-wiring contracts for the year ending Dec. 31, 1919, has been set and according to all indications will be reached with a good margin to spare.

SOUTHERN CALIFORNIA EDISON CO. SHOWS BIG LOAD INCREASE.

Prospects Also Particularly Good According to Reports from District Offices.

According to the reports from the various district offices of the Southern California Edison Co., Los Angeles, Cal., the present year promises to be a notable one in the annals of that company. During the past month many of these districts have secured considerable increases in their power loads and the prospects for the future development along these lines is also particularly good.

The Oxnard district during May and June signed up more than 300 hp. while the Whittier district during the latter month added 224 hp. to its lines. The San Bernardino district recently completed the installation of 500 hp. additional, for the Fontana Land Co. for pumping purposes and Pomona just completed the installation of 100 hp., replacing a steam plant. The station output for June at Lancaster was 804,000 kw-hr. Thus far this year this district has added 388 hp. to its lines and still has 182 hp. yet to be connected. The Ventura district reports that the power business for June more than doubled that of the same month in 1918.

Since April 1, 1919, 377 shares of the company's stock have been sold to the employes of the Los Angeles office and 190 shares disposed of through this office to the public.

CRIPPLE CREEK SHORT LINE TO BE ELECTRIFIED.

Electrification Expected to Effect 20% Saving in Operating Expenses—Central-Station Service to Be Used.

Work on the electrification of the Cripple Creek Short Line railroad, which operates between Colorado Springs and the gold mining camps in that section, is expected to begin early in September. Electric power for the operation of the road, according to a recent announcement, will be purchased from two central-station companies, one of which is to be the Arkansas Valley Railway, Light & Power Co. By electric operation the railroad expects to reduce its operating expenses 20%.

Contracting-Construction

New Chicago License Ordinance—Considerations in Selecting an Electrical Contractor — Iowa Contractors to Meet

NEW CHICAGO ORDINANCE COVERING LICENSING OF ELECTRICAL CONTRACTORS.

Principal Features of License Law to Become Effective Sept. 1.

The new ordinance governing the licensing of electrical contractors, fixture hangers, maintenance and sign men in Chicago, which was briefly outlined in a previous issue. has been passed and will go into effect Sept. 1, 1919. The changes in the new ordinance are substantially as follows:

Any person or corporation making application for permits must first file with the Commissioner of Gas and Electricity an application containing an affidavit stating that the work to be done under such permits will be under the supervision of a person who is not less than 21 years of age, who has a thorough knowledge of electrical construction and who has had not less than four years of practical experience in installing or maintaining electrical wires and apparatus in the class mentioned in the application for license and who shall also have regularly passed the examination as provided for hereinafter. The application shall be made upon a form prepared and approved by a Board of Examiners, to be appointed by the Mayor for the purpose of inquiring into and ascertaining the qualifications of the applicant and of the supervising electrician, as provided herein. Such application shall contain the name and signature of the person under whose supervision the work is to be done, together with two indorsements from responsible citizens, made under oath, that such person possesses the qualifications above designated. Upon filling such application in proper form and upon the deposit of an amount equal to the license fee for the class of license being applied for, and upon the supervising electrician successfully passing the examination provided for, the deposit will be transferred to the City Collector, which deposit the City Collector shall receive as the license fee for the said applicant, and the Commissioner of Gas and Electricity shall issue, or cause to be issued, the license applied for, which license shall entitle the licensee to obtain permits to do such work as shall be within the classification covered by such license. The license fee for the first year for a general electrical contractor shall be $200 with a renewal fee of $50 for each year. The license fee for the first year for electrical construction only shall be $100 with a renewal fee of $25 for each year. The license fee for the first year for a fixture license, including such persons or corporations doing fixture work only, shall be $100, with a renewal fee of $25 for each year. The license fee for the first year for a sign license, including such persons or corporations doing sign work only, shall be $25, with a renewal fee of $10 for each year. The license fee for the first year for a maintenance license, including such persons or corporations doing maintenance work in buildings owned or controlled by such persons or corporations, shall be $25, with a renewal fee of $10 for each year. The above classification of licenses and the fees pertaining thereto shall not immediately apply to those certificates of registration in existence but shall apply at the expiration of the period for which they are issued, at which time a renewal fee in accordance with the above classification must be paid before the renewal is made.

Prior to the issuance of a license for general electrical contractor, electrical construction, fixture license and sign license, the applicant shall file with the City Collector of the City of Chicago an indemnifying bond with good and sufficient sureties in the penal sum of $5000, such bond being payable to the Commissioner of Gas and Electricity of the City of Chicago, for the use of those with whom the applicant shall thereafter contract to do work, to indemnify for damages sustained on account of failure to perform the work contracted for, in accordance with the provisions and requirements of the City of Chicago, relating to the installing, operating or maintaining of electrical wires or apparatus. The filing of the above mentioned bond shall be required previous to the issuance of any original license or the renewal of any Certificate of Registration in existence at the time of passage of the ordinance.

For the purpose of ascertaining the qualifications of the applicant and of the supervising electrician, the Mayor shall appoint an Examining Board of five members to consist of the following: Commissioner of Gas and Electricity, chairman; one member to be selected from the Board of Underwriters of the City of Chicago, one member to be a general electrical contractor regularly engaged in the contracting business in the City of Chicago, one member to be a journeyman fixture hanger who has had at least five years of practical experience, and one member shall be a journeyman electrician who has also had at least five years of practical experience. Such members shall hold office for a period of one year or until their successors are duly appointed. It is also provided that the Examining Board shall have power to adopt the necessary rules and regulations for the licensing of electricians and for the examination of supervising electricians and such examinations shall be conducted by the oral and written method and the judgment of the board as to whether or not an applicant or supervising electrician is qualified and has sufficient experience and knowledge for the particular class of license applied for shall be final.

Where a Certificate of Registration is in existence at the time of passage of this ordinance a renewal of such Certificate shall only be made within the classification previously placed on such Certificate by the Commissioner of Gas and Electricity, and for the purpose of transferring to or renewing a Certificate of Registration in any other class, as provided for herein, the Supervising Electrician must submit to and properly pass an examination such as will deter-

mine his experience and qualifications to act as Supervising Electrician in the particular class of business to which he desires to transfer.

The ordinance also provides that all licenses issued are transferable, but such transfers cannot be made until transferee has complied with all its terms. The supervising electrician may also be replaced at any time, providing the new man shall comply with the terms. No fee is to be charged for such transfers.

The Board of Examiners will meet as often as it deems necessary and must act on all applications within 45 days from the date of filing. Applications must be filed 15 days before the time set for the examination. The Board of Examiners also may recommend the revocation or suspension of a license for any violations. A license may be suspended by the Commissioner of Gas and Electricity for a period not to exceed 30 days and may be revoked by the Mayor.

The ordinance also provides for the following payment of fees:

Wiring only for lighting circuits (not including fixtures, sockets or receptacles). For the inspection of each complete branch lighting circuit of 660 watts or less a sliding charge is made ranging from $1 for the first circuit to 40 cents for each circuit over 25. For the inspection of each complete branch lighting circuit of larger capacity than 660 watts the charge shall be in proportion to the wattage of such circuit. For the inspection of additional outlets on existing circuits: 20 cents for each outlet on which a socket, receptacle or fixture will be attached.

Electrical fixtures, sockets and receptacles (not including the circuit feeding same). For the inspection of fixtures, sockets or receptacles for lamps of nominal 50 watts capacity the charges range from 50 cents for from 1 to 15 lamps to 25 cents for each group of 25 or less in quantities above 200. For lamps of larger or smaller capacity the charge shall be in proportion to the wattage of the lamp. For the inspection of both circuit wiring and fixtures, sockets or receptacles: The aggregate sum of the fees as shown above for wiring and for electrical fixtures.

For the inspection of each electrical horsepower of 746 watts used for mechanical or other purposes than above mentioned, the sum of $1 for each horsepower from 1 to 5 hp., inclusive for each of the next succeeding 5 hp., 75 cents; for each of the next succeeding 5 hp., 65 cents; for each of the next succeeding 10 hp., 55 cents; for each of the next succeeding 25 hp., 50 cents; for each of the next succeeding 200 hp., 25 cents; for each of the next succeeding 250 hp., 10 cents; and for each additional horsepower, 5 cents.

Inspections of electric lights, other than electric signs as herein defined, placed on a public street or alley for the purpose of illuminating the same, temporary installations for show window exhibitions, conventions and the like, underground or overhead wires and apparatus, and all other inspections not specifically provided for herein, shall be charged for according to the time required for such inspections at the rate of $1 per hour. Reinspection shall also be charged for at this rate.

The fee for all signs projecting at right angles or obliquely from the building against which same are placed, whether such signs are vertical or horizontal, and not being flat signs as hereinafter described, shall be computed at the rate of 15 cents per annum per square foot of sign surface on each illuminated side of such sign. The fee for all signs placed against a building running parallel thereto and not projecting obliquely or at right angles therefrom shall be computed on a sliding scale, based on lamps of 50 watts capacity, varying from 10 cents each for the first 25 lamps to 4 cents for each additional lamp above 300.

IMPORTANT CONSIDERATIONS IN SELECTING AN ELECTRICAL CONTRACTOR.

Interesting Pamphlet on This Subject Being Distributed by Louis Kalischer, Inc., Brooklyn.

"Important Considerations in Selecting an Electrical Contractor" is the title of a pamphlet recently published by Louis Kalischer, Inc., 1225 Myrtle avenue, Brooklyn, N. Y. This pamphlet, which is intended for distribution among manufacturers and users of industrial apparatus, brings out very clearly the importance of properly selecting a competent electrical contractor to install the electrical equipment for an industrial enterprise.

"The electrical equipment of an industrial plant," the article states, "is conceded to be of vital importance to its successful commercial operation.

"The maximum result of an efficient design in manufacturing is based on continuity of service, and it is within the range of possibility that the best and most carefully thought out plans to accomplish this may be seriously affected by improper or inadequate consideration of the electrical equipment.

"Changes in manufacture to accomplish higher efficiency may be met at times without great effort or expense, but this does not always apply to the electrical equipment, therefore, greater care must be exercised in the original layout. Furthermore, the entire electrical equipment of a plant is installed at the inception of the building project and is considered a building or one-time operation. In selecting an electrical contractor to undertake the work, it is important that the results of previous experiences in the same or similar lines of business should be taken advantage of, as an inefficient design of a plant constitutes a continuous loss.

The article then relates the experience of Louis Kalischer, Inc., and describes the facilities of this company which enable it to meet these requirements satisfactorily. In addition to a competent, practical engineering force this company has also put into effect an up-to-date follow-up system by which a check is kept on material and apparatus deliveries from manufacturers and eliminates to a considerable extent the difficulties often encountered by poor deliveries. "Service Plus Satisfaction to the Customer" it explains, has always been the keynote of the business.

This company is now erecting a new building at 288 Livingstone street, Brooklyn, where it will conduct a modern electrical retail store and carry a complete stock of all electrical devices of standard merit.

IOWA CONTRACTORS MAKING PLANS FOR ANNUAL CONVENTION.

The Iowa State Association of Electrical Contractors and Dealers plans to hold its next annual convention in Sioux City, Iowa. The exact date of the meeting has not been definitely determined as yet but indications are that it will be held during the last week of September. F. Bernick, Jr., Oskaloosa, Iowa, is secretary of the association.

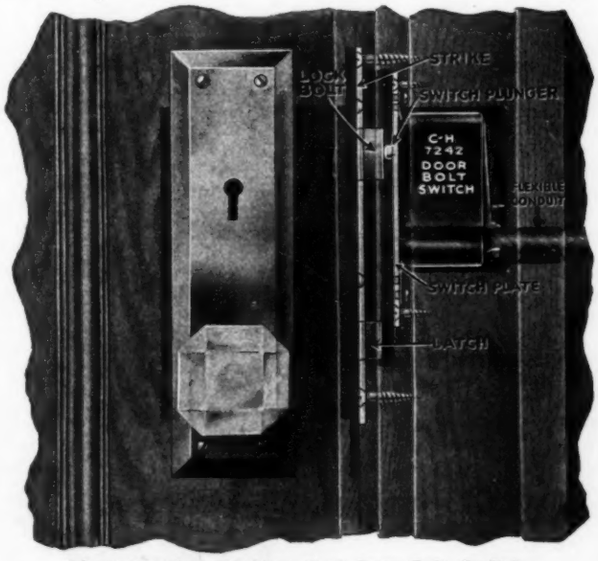
New Appliances

Door-Bolt Switch for Hotels — Cutter Outdoor Line and Disconnect Switches — Volt-Ammeter for Automobile Use

New Door-Bolt Switch for Hotel Guest Rooms.

To prevent the wasteful use of electric light in their guest rooms, hotels and clubs often display in each room a sign reading, "Please turn out the lights when leaving the room." The new C-H door-bolt switch, which has been developed by the Wiring Device Department of the Cutler-Hammer Manufacturing Co., Milwaukee, Wis., accomplished what the sign aims to do. When the occupant of a room leaves and locks the door from the corridor side, this switch is operated by the lock bolt, the lights within the room are cut off, and the wall switch made inoperative. When the door is unlocked the wall switch may be used to control the lights. This new door-bolt switch, although similar in shape to the well-known C-H door switches, is operated by the lock bolt of a two-bolt lock, such as is generally used in hotels. The new switch is mortised in the lock side of the door jamb in back of either a flat or box strike, and is connected in series with the regular wall switch that controls the lights within the room. As it is customary to install the regular wall switch conveniently near the door, very little additional wiring is necessary for the installation of the door-bolt switch.

The accompanying illustration shows the details of this new device and how the movement of the lock bolt will push against the switch plunger and thus open the switch. In this phantom view the switch is shown mounted in the door jamb with wood screws. The switches can also be mounted on the strike by using spacers and machine screws, the latter furnished with the strike, two holes being tapped in the switch plate for the screws. Being purely a mechanical device, the life of this switch should be as long or longer than the ordinary wall switch. Since it works with the locking of the door, the reader will readily appreciate that its regular use is practically automatic and that it will be instrumental in the saving of much lighting current to the hotel manager.



Phantom View of New C-H Door-Bolt Switch.

New Line of Outdoor Load and Disconnect Switches.

This is the age of urban and interurban electric power distribution. Not only do many city employed people live far out in the country and require city conveniences, but the farmer is fast becoming a convert to the use of electric power and light. Many manufacturers are moving out also to obtain the advantages of cheaper sites, lower taxes, lower insurance rates, more stable labor, etc., and the factories are especially good electric power customers.

Then, too, the small rural towns and communities can be served with a profit to the public utility if the cost of the substation for stepping down transmission voltages can be kept reasonably low and not require continual care by an operator. During the past ten years this business has been rapidly expanding because of the development of outdoor protective and switching equipment. There still remains much to be desired in the way of reliability for outdoor equipment. The utility man will therefore be especially interested in the following announcement:

The George Cutter Co., South Bend, Ind., is placing on the market the first items of a line of high-tension transmission equipment which will be sold under the trade name of "Clear Break Equipment."

The first of these items is an outdoor, air-break switch which is designed for rupturing load current under the most severe conditions. This switch is designated the type "T" switch and will be furnished regularly in 150-200-ampere capacities and for rated voltages of 22,000, 33,000, 44,000, 55,000 and 66,000. Developments now under way will take care of voltages of 90,000 to 150,000 and higher, if desired.

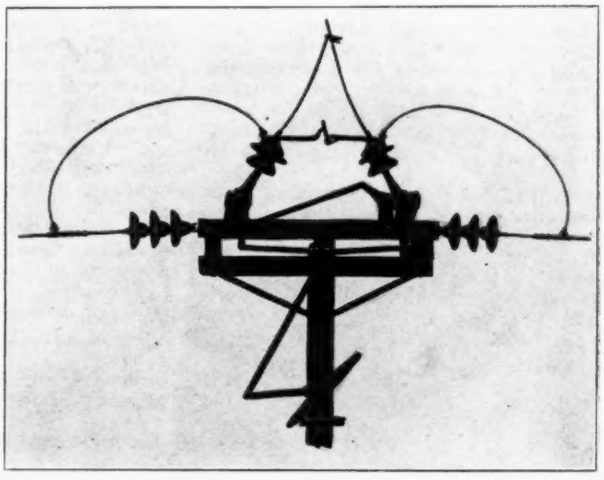


Fig. 1.—Cutter Type "T" 33,000-Volt Switch in Closed Position.

These switches will be furnished hand-operated, automatic or non-automatic overload release, also motor-operated, automatic or non-automatic overload release. Inasmuch as standard series and shunt-trip mechanisms will be used in connection with standard circuit-closing relays, time-element devices are readily applicable. The switches may be obtained in one, two or three-pole arrangement and are readily mounted on wooden poles or steel towers.

Regularly the 22,000 and 33,000-volt switches are designed for mounting on a framing arranged on one pole. The 44,000 to 66,000-volt switches, which are considerably heavier and with wider phase spac-

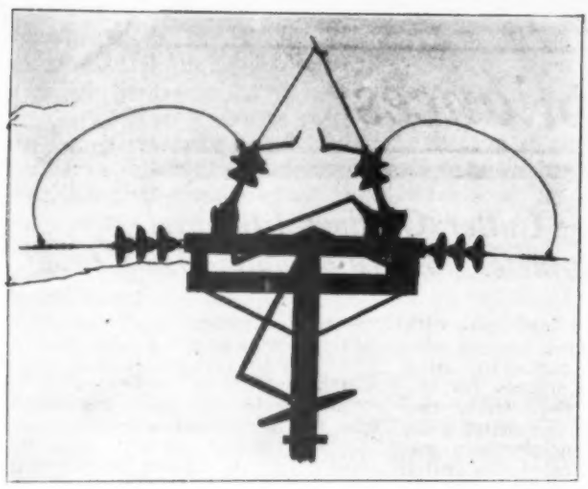


Fig. 2.—Same Switch Partly Opened with Auxiliary Contacts Ready to Open.

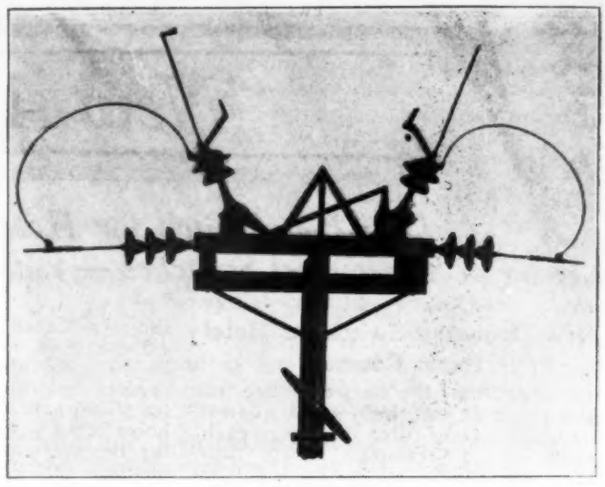


Fig. 3.—Same Switch Entirely Opened, Showing Wide Separation of Contacts.

ings, are arranged for mounting on two wooden poles. The construction, however, is such that they are readily adapted to suit almost any condition.

The second item to be announced at this time is a line of switches known as the type "D," which are designed for disconnect purposes only but are arranged to operate all legs of the switch simultaneously from a ground lever which may be readily locked in either the open or closed position.

The especially novel feature in connection with the type "D" line of switches is the fact that only a pole and the strain insulators for dead-ending are required for mounting the switch. The switch framework, consisting of 3 by 4-inch angles, furnishes the necessary double arming for dead-ending the lines on each side.

These switches are furnished with insulators rated at 22, 33, 44, 55 and 66 kilovolts and all give a little more than 2 ft. of clear separation between live parts when switches are in the open position. No auxiliary contacts are provided on the type "D" line of switches to prevent blistering of the main contacts in case of opening with line current.

A very noteworthy feature of both the types "D" and "T" switches is what is known as the spring type of contact for the main current-carrying capacity. These contacts are identical for all of the type "T" and "D" switches rated from 22 to 66 kilovolts and consist of a multiplicity of parallel spring wires, each seating in a "V" notch in the other member of the contact and arranged to be bent back when in the closed position so as to exert a pressure against the notch. This insures a constant large carrying capacity by each one of these wires, which under tests of 10 to 12 times their rating have shown no injurious results. This contact was designed to meet the great demand for a contact which would stand up and continue to give satisfactory service under ice conditions and would also not weld electrically and prevent opening. Good seating is insured by a wiping action.

The type "T" switch is provided with an auxiliary or arcing contact (not a horn), which ruptures the line current at its tip when opening. The arc is thus drawn at a point well above the grounded framework and is drawn in a vertical plane parallel to the phases. This prevents shortening of phase spacing in opening and this, in connection with the quick, long break given, insures prompt interruption of the current.

The 22,000 and 33,000-volt type "T" switches have a phase spacing of 6 ft. and in opening stretch the arc to 6-ft. length. The 44, 55 and 66-kilovolt type "T" switches have a phase spacing of 8 ft. and in opening stretch the arc to 8-ft. length. The 90 to 150-kilovolt type "T" switches will be furnished regularly with phase spacings of from 12 to 15 ft. and will stretch the arc in opening from 14 to 18 ft.

On all of the type "T" and "D" switches for voltages from 22,000 to 66,000, standard pin-type insulators with ¾-in. separable thimbles are used and the insulator caps are held on by especially formed rings in the groove under which setscrews in the cap are engaged, forcing the cap down rigidly onto the top petticoat of

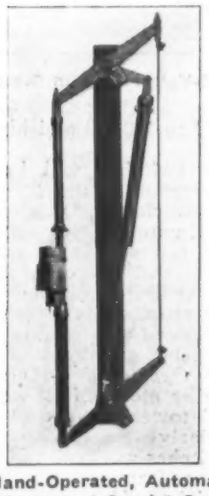


Fig. 4.—Hand-Operated, Automatic Overload Release and Special Operating Mechanism.

Fig. 5.—Cutter Type "D" 44,000-Volt Disconnected Switch in Closed Position.

Fig. 6.—Same Switch in Wide Open Position.

the insulator. The setscrews exert no direct pressure against the porcelain. Type "T" switches for voltages above 66,000 will be equipped with built-up post-type insulators.

Any of the type "T" switches can be furnished with outboard insulators mounted on an extension of the channel-iron support and with rigid pantograph-type line connector between the rotating and the stationary insulators. This latter arrangement is for use where switches are units of power and substations and line spans thus terminated.

Fig. 1 shows one leg of a type "T" 33,000-volt switch in closed position with the upper operating mechanism for hand operation. The ground lever is not shown. Fig. 2 shows the same switch partially opened until the main contacts are disengaged sufficiently to prevent re-establishing of the arc and the auxiliary contacts, at their tips, just at the point of separation. Fig. 3 shows the same switch in the wide open position and the long break between auxiliary contacts. The action of the No. 0 copper-clad flexible line connectors is readily seen from these three cuts.

Fig. 4 is a hand-operated, automatic overload release and operating mechanism for mounting in place of the regular ground hand lever. This mechanism is equipped with trip coils for operating from the secondaries of current transformers or may be furnished with mechanical trip from series of trip coils mounted on top of outboard insulators or any other suitable adjacent insulators.

Solid steel wire is used to connect the two ends of the upper operating lever on the switch Fig. 1 with the corresponding two clevis ends on the top lever of this automatic device, which is placed directly below at the foot of pole. The lower lever arm of this automatic device is locked in its present position by means of a latch and bolted on the arm, which are not shown. In case of overload either one or two strip coils, placed in the housing, midway up on the left, will trip a catch, which is also in this housing, and allow a heavy coil spring in the pipe housing on the right side to rotate the upper lever through 90°, the lower lever arm remaining fixed until released by the operator and brought back to again engage the trip catch. The switch can then be closed again, if desired, but cannot be held closed in case the overload condition still exists.

Fig. 5 shows one leg of the type "D" switch for 44,000-volt service with ground operating lever and push rod shortened to show in the picture. This view shows switch in the closed position. Fig. 6 shows the same switch in the open position.

The type "D" switch is furnished without the regular flexible line connector except when ordered. As the angle of rotation is small, the use of solid hard-drawn copper wire bolted rigidly to the switch arm and the line wire, with loop for flexibility, is ample.

It will be noted that holes are provided in the ends of the cross angles for terminating line wires through strain insulators. The stringer angles on the type "D" switch are extended on each side of the pole so as to give a 3 ft. 8-in. phase spacing on the 22,000, and 33,000-volt switches and 6 ft. on the 44,000 to 66,000-volt switches. A double angle brace is provided for each stringer angle, giving ample rigidity of construction.

This equipment was designed by an engineer who has spent years in the study of outdoor substation equipment with a view to eliminating troubles being encountered, and these troubles as summarized may be stated as follows:

Failures are due generally to:

1. Striking between phases when opening.
2. Striking to ground when opening.
3. Contacts burning and welding so they cannot open.
4. Contacts freezing from ice so they cannot open nor flow.
5. Mechanical shock or blow to insulators, causing breakage and failure of same.
6. Insulators often under torsion, causing separation of units and failure.
7. Dependence on horns to carry arc upward and stretch to rupturing length.

It is the belief of the engineering department of the George Cutter Co. that to a large extent the difficulties and failures enumerated above have been eliminated. This is borne out by the fact that several of the type "T" switches have been giving excellent satisfaction for more than five years. A number of improvements have been added to the original design which add materially to the merits of the design and to the serviceability. Further, at the National Electric Light Association convention held at Atlantic City, N. J., May 19-22, where samples of this equipment were exhibited, engineers were unanimous in their high praise.

New Automobile Type Volt-Ammeter for Testing Lighting and Starting Systems.

Troubles in the lighting and starting systems of gasoline automobiles are not very frequent, but when they occur they are very vexatious and hard to locate. To facilitate the location of trouble it is essential to have a convenient and dependable measuring instrument for determining current and voltage.

An instrument of this type especially designed for this service has recently been placed on the market by the Roller-Smith Co., 233 Broadway, New York City. It is known as the "Handy" auto type volt-ammeter. The illustration herewith shows at a glance the appropriateness of this name, since the instrument has dimensions of only 4 by 5 by 2 in. and its weight is only 20 oz. The instrument is of the permanent magnet and moving-coil type, giving dead-beat indications and providing uniform divisions of the scale. The instrument most commonly used for this purpose has six ranges, of which three are for voltage and three for current measurement. The former include a scale of 0-75 millivolts, which is useful in making tests of commutators; a scale of 0-3 volts for testing voltages of individual dry cells or storage cells; a scale 0-30 for testing battery voltages of lighting and starting batteries of any of the usual combinations up to 12-cell batteries. The current scales are 0-3, 0-30 and 0-300, the first being used for testing current taken by lamps, ignition circuits, etc., the second for testing generator output, charging current, etc.; and the last for testing the starting current. For use as an ammeter, the instrument is provided with three shunts which are all mounted on base with suitable terminals for convenient connection to the instrument and the circuit being tested. These instruments are also made in several other ranges. A special leather carrying case for the instrument, shunt and the connecting leads can be provided at a small additional expense. These instruments are especially suitable for use in garages and service stations.

"Handy" Volt-ammeter for Automobile Testing.

Trade Activities

New Agency for Green Engineering Co. — Jewell Instrument Sales Organization — Many Electric Furnaces Sold

The Sierra Electric Co., San Francisco, Cal., has been appointed Pacific Coast distributer for the Chicago Solder Co., maker of Kester self-fluxing wire solder. Both acid-core and rosin-core solder will be carried in stock.

Boyle Engineering Co., Cincinnati, Ohio, announces that it is now occupying its new building at 2023 Reading road. This company handles all kinds of electrical equipment for automobiles, and represents 18 electrical organizations.

The Electric Appliance Co., Seattle, Wash., has moved from 118 Spring street to 1214 Third avenue, where a large store room has been fitted up for handling general electrical appliances. The company is now specializing in washing and ironing machines.

The Central Electric Co., Chicago, Ill., has issued price list 39-A, which applies to the company's general catalog No. 39 and is unique in the fact that it carries, along with the prices in that catalog, addenda pages listing new or redesigned devices that have not been previously included.

The Electric Products Co., manufacturer of Wotton battery-charging motor-generators and rheostats, vehicle motors, controllers and switchboards, Cleveland, Ohio, has just opened a branch office in Detroit, Mich., at 2306 Dime Bank building. E. H. Bridge has been placed in charge as district manager.

Surf Manufacturing Co., Milwaukee, Wis., manufacturer of electric washing machines, has acquired 14,000 sq. ft. of the building at 109-113 Clinton street. The new company, which has recently completed its organization, is capitalized for $100,000, and expects to build more than 5000 machines during the coming year. It is said that the product of the company employs an entirely new principle of mechanical washing. The officers of the company are as follows: O. F. Fischedick, president; J. Hoffman, vice-president; A. Schmidt, secretary, and A. W. Kerhan, treasurer.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., is furnishing to dealers who handle C-H electric irons and other C-H electrical appliances a new four-page two-color folder which has for its title "The Aristocrat of the Laundry," illustrative and descriptive of the C-H electric iron. These irons are made in four sizes, 3, 6, 7½ and 9 lb., three of which are illustrated in the folder. The cords of all C-H irons are equipped with the C-H 7050 switch, which is being advertised in the national and trade media as well as by direct mail. Space is provided on page 4 of the folder for the dealer's imprint.

International High-Speed Steel Co. announces the removal of its New York City office to 294-6 Lafayette street—129-31 Crosby street. The general business of the company will hereafter be conducted from its works at Rockaway, N. J.

Simplex Electric Heating Co., 85 Sidney street, Cambridge, Mass., is sending out two new and attractive display cards, 9¼ by 11 in., printed in colors, one featuring the Simplex electric iron and the other the No. 27 domestic range. These are being sent to the leading distributers of Simplex products with the request that they order for themselves and their customers the quantity which they can use to advantage.

The American Steam Conveyor Corp., Chicago, Ill., has just announced the appointment of H. S. Valentine as sales engineer in charge of Philadelphia territory. An office has been established in the North American building, Philadelphia. Mr. Valentine is an experienced mechanical engineer and was connected with the Link-Belt Co., Philadelphia, for five and one-half years, with the Brown Hoisting Machine Co., and Yale & Towne Manufacturing Co. for six years, and with the Badenhausen Co. for one year.

Novo Engine Co., Lansing, Mich., has issued an instruction book and repair list for Novo engines (No. 819); this is a valuable reference book for those employing this type of engine. A detailed description of the principles of operation as well as instructions for installation and operation are given, accompanying which are many diagrams to clarify the text. The company has also issued Bulletin No. 18 entitled "Novo Reliable Power" containing a detailed description of the Novo engine. It points out the salient features of this engine and the advantages of the vertical design. Illustrations of various types of engines are included.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has issued Catalog No. 107, illustrating and describing its ore concentrating machinery and equipment. This includes crushers, rolls and ball granulators, sizing and classifying apparatus, concentrators, elevating, conveying and transmission machinery, power-generating and electrical equipment, pumps, etc. The catalog contains 112 pages, printed on a very fine grade of paper and the back inside cover gives a list of the district offices, foreign district offices, Canadian representatives and foreign sales agencies. Page 112 gives an alphabetical list of Allis-Chalmers' principal products. The cover is in four colors and shows a typical concentrating mill.

Blaw-Knox Co., Pittsburgh, Pa., announces the appointment of K. C. Murray as an engineer-salesman in the Knox department. Mr. Murray is a graduate of the Pennsylvania State College and was for many years connected with the Carnegie Steel Co., both at the Edgar Thompson Works, Bessemer, Pa., and in the sales department. He will, for the most part, devote his activities to the steel plants in the Pittsburgh district.

Green Engineering Co., East Chicago, Ind., manufacturer of Green chain-grate stokers and related products, announces that the firm of Bull & Livensparger has been appointed as its sales representative in Chicago and northern Illinois. They have taken charge of the company's Chicago office, 14 East Jackson boulevard, and are prepared to handle all inquiries respecting Green chain-grate stokers, Sealflex arches, steam-jet ash conveyors, cast-iron ash tanks and allied products and replacements for the same. E. H. Bull has been connected with the company as an engineer for the past seven years. D. A. Livensparger has been a member of its sales force for the past nine years.

Jewell Electrical Instrument Co., Chicago, during the past two years has been pursuing a policy of concentrated sales work with representatives in the larger cities and electrical manufacturing centers in the United States, with the result that today it has a sales organization, the personnel of which is second to none. Frederick Rall, 19 Park Place, New York City, covers the state of New York, New York City and adjacent territory, George E. Linton, the Boston territory with offices at 10 High street, Boston Mass., & Benjamin B. Baseler 1716 Sansom street, Philadelphia, Pa., the territory of Philadelphia and Eastern Pennsylvania, Western Pennsylvania is covered by the Superior Engineering Co. located at Jenkins Arcade, Pittsburgh. H. L. Porter, 1202 Illuminating building, Cleveland, Ohio, covers Cleveland and Northern Ohio. Missouri is covered by C. B. Fall Co. with offices in the Railway Exchange building, St. Louis, Mo. Minnesota territory is covered by W. F. Uhl, with offices at 505 First National Bank building, Minneapolis, Minn. More Electric Co., covers the state of Colorado, its offices being located in the Gas & Electric building, Denver, Colo. L. Brandenberger, Walker Bank building, at Salt Lake City, covers the state of Utah. Nixon-Kimmel Co., Lincoln and Main street, Spokane, covers Spokane and Eastern Washington. Burton R. Stare Co., covers Western Washington and Oregon and has offices at 325 Yesler Way, Seat-

tle, Wash. C. F. Henderson, Call building, San Francisco, covers territory of San Francisco and northern California. O. E. Thomas Co., 625 Washington building, covers Southern California, including Los Angeles, its offices being located in Los Angeles. With the exception of Filer-Smith Machine Co., in Winnipeg, who covers Winnipeg and Western Canada and the Tokiwa Co., of Tokyo, Japan, in the Orient, all foreign representation and export business is handled by the Frank E. Watts, Inc., 50 Church street, New York City.

The Electric Furnace Co., Alliance, Ohio, has just shipped to the Dayton Engineering Laboratories, Dayton, Ohio, an electric furnace for melting and refining aluminum in the Delco plant. This furnace has a hearth capacity of 500 lb. and a melting rate of 200 lb. of aluminum per hour. It is equipped with a double charging door in the front and rear, and otherwise is similar to the standard Baily electric furnace of 105-kw. electrical capacity, and 1500-lb. hearth capacity, that is used for melting brass.

The Electric Storage Battery Co., with general offices Allegheny avenue and 19th street, Philadelphia, Pa., is distributing a new booklet, Form 881-R, devoted to its "Ironclad-Exide Battery." This booklet has been revised and brought up to date. It gives a general description of these batteries with illustrations, reviews their development, and also contains a brief history of the company, which maintains "Exide" depots in Boston, New York, Philadelphia, Cleveland, Washington, Rochester, Chicago, Detroit, St. Louis, Kansas City, Denver, Atlanta, Minneapolis and San Francisco. A corps of inspectors are constantly traveling through the country coaching users of its batteries.

Roller-Smith Co., 233 Broadway, New York City, announces that it has made an agency arrangement with L. B. Gottschall, 211 North St. Paul street, Dallas, Tex. Mr. Gottschall will handle the Roller-Smith company's lines of instruments, meters and circuit breakers in the state of Texas with the exception of a small portion in the western part of the state. He has had an extensive experience in the sale and installation of electrical apparatus in his locality and his technical ability and wide acquaintance with the trade place him in an excellent position to handle the company's rather complex lines. The company is also distributing Bulletins No. 73 and 74, describing "Standard" type circuit breakers. The under-voltage, overload and combined overload and under-voltage types are furnished for both alternating and direct current, the underload type being furnish for direct current only.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued Circular No. 7375 describing the Westinghouse achievements in field of electrical precipitation. The process applies to copper, lead or zinc smelters, blast furnaces, chemical, acid and cement plants for the recovery of valuable material otherwise wasted. Water can be precipitated from oil, dust removed from ventilating systems, etc. It is also applicable to operations such as round houses which by their smoke or fumes are a nuisance to the surrounding territory. The necessary apparatus for the precipitation process such as motor-generators, transformers, rectifiers, motors, switchboard and accessories are shown installed, and are described in detail in this circular. While there are several mechanical and chemical methods for collecting or suppressing dust in furnace and kiln operation, they are in general limited in application by conditions of temperature, acid, and similar qualities of the product to be handled. Electrical precipitation has few limitations of this sort and is generally applicable for collecting suspended solid and liquid particles of every description, whether acid, alkaline, or from gases of widely varying temperature.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has prepared for further publicity on the C-H Seventy Fifty switch eight two-color stickers which will be used on the outgoing mail from the company's home and eight district offices. These will be furnished to dealers, contractors, jobbers and central stations, for use on letters, envelopes, folders, packages and similar material. Four of the stickers have been prepared especially for the jobber and others who do not come in direct contact with the consumers, while the other four are especially for the dealer. They direct the customer to bring their appliances cords to the dealers to have them equipped with C-H Seventy-Fifty switches, thus following the trend of all the national and direct advertising being done on this switch of convenience and safety.

Wallace & Tiernan Co., Inc., New York, has the distinction of having its liquid chlorine apparatus for treating water used in hundreds of cities throughout the United States. It is estimated that the company's apparatus makes 3,000,000,000 gal. of water fit for consumption daily, an amount that to flow over Niagara Falls would require 44½ minutes. The average cost of the chlorination by this system is said to be less than 50 ct. per 1,000,000 gal. The company has recently issued another edition of its booklet, "Protecting the Water Supply of Greater New York." This describes how the W. & T. apparatus was adopted after a competitive test for purifying New York City's water supply, and contains also much general information on the metropolitan problem. Copies of the booklet will be mailed free upon request.

Morse Chain Co., Ithaca, N. Y., is distributing publication No. 14 revised as of June, 1919, illustrating and describing the Morse silent chain and showing a few of the many large power drives of 100 hp. up to 5000 hp. A table of data to be used in the preliminary design of Morse silent-chain drives is included. The bulletin contains full and complete data necessary for filling out the blank inquiry page and securing estimates and details of the Morse chain drive. The application of this chain for transmitting large powers has come to be recognized, not only as good mechanical practice where the specifications favor such a drive, but as highly desirable on account of its great efficiency, quiet operation, low upkeep cost and long life in many places where belts or gears could be used. The marked popularity of the Morse silent chain for the larger powers is not confined to any particular field, but is well distributed over every industry.

Edwards & Johnston, Indianapolis, Ind., is the name of a recently organized firm which will devote its services to investigations, research, engineering, accounting, supervision, management, financing, appraisals and rate cases, of electric light and power plants, gas, water, heating and telephone plants, and electric street, urban and interurban railway properties. C. A. Edwards, senior member of the partnership, was until recently and for nearly six years a member of the Indiana Public Service Commission, and formerly a banker and successful merchant. He will have personal charge of all cases before state commissions and the Interstate Commerce Commission. J. K. Johnston, the other member of the partnership, is a telephone engineer of Indianapolis. Both members of the new organization have made splendid reputations in their lines of endeavor and are especially well known in Indiana and Ohio.

The Electric Furnace Co., Alliance, Ohio, has just installed a battery of two Baily Electric furnaces at the Capital Brass Works, Detroit Mich. These furnaces are the standard 105-kw. tilting type with hearth capacities of 1500 lb. each. They will be used for melting yellow brass scrap and borings in the foundry. The Buick Motor Co., Flint, Mich., has just purchased a second Baily electric furnace for melting phosphor bronze. The furnace is of the tilting type, rated at 1500 lb. hearth capacity, and an electrical capacity of 105 kw. The Akron Bronze & Aluminum Co., Akron, Ohio, has installed a 50-kw. rectangular tilting type Baily electric furnace in its jobbing foundry. This furnace has a hearth capacity of 300 to 500 lb. and will be used for a wide variety of compositions. Heats will range from 100 to 500 lb. and will include gun metal, phosphor bronze, red and yellow brass.

Electric Storage Battery Co., Philadelphia, Pa., is distributing a new publication on the subject of the "Ironclad-Exide" battery as used on industrial trucks and mine locomotives, pointing out their importance and efficiency in the transfer of material. The industrial truck and the mine locomotive are illustrations of modern methods of haulage, and there are few up-to-date manufacturing establishments or mines that could not employ one or more of these units. They do the work of many laborers and speed up the haulage so that not only greater quantities of goods are moved but a large economy in labor is secured. The applications of electrically propelled trucks and tractors, which are found in manufacturing establishments throughout the country and used in railway and wharf haulage and mines, on which the "Ironclad-Exide" battery is extensively used, are shown. Copies of this interesting booklet may be secured from any of the sales offices of the company or by direct request to its general offices at Philadelphia.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Liberty, Me.—Liberty Light & Power Co. has incorporated with a capital of $5000 to generate and distribute electricity for light, heat and power service in Liberty. H. W. Maitherson is president and J. P. Sanford, clerk and treasurer, both of Liberty.

Laconia, N. H.—Scott & Williams have recently broken ground for the construction of the proposed 1-story boiler plant at their works, and favorable progress is being made. The structure is estimated to cost $20,000. Lockwood, Greene & Co., 60 Federal street, Boston, Mass., are engineers for the company.

Woonsocket, R. I.—Barnard Worsted Co., 92 South Main street, has awarded a contract for the construction of a new boiler plant at its works, to be erected in connection with a new dye plant. The work is estimated to cost $14,000.

New Britain, Conn.—Considerable electric equipment, including motors, and other electrical machinery, will be required by the Hart & Hutchinson Co., Corbin avenue, in connection with the construction of a large 1-story plant, about 77 by 340 ft., estimated to cost $65,000, contract for which was recently awarded. The company manufactures steel lockers and kindred equipment.

Brooklyn, N. Y.—Announcement has been made that John H. Delaney, transit construction commissioner, has authorized the New York Consolidated Railroad Co. to contract for the construction of 100 additional steel cars for operation on the subway and elevated lines of the Brooklyn Rapid Transit System. The new rolling stock will cost about $1,628,000, or approximately $12,049 for each car body and $2117 for each motor, deliveries to be made within 14 months.

Brooklyn, N. Y.—A. Arnesen, Inc., operating an electrical contracting establishment at 312 Court street, has filed notice with the Secretary of State of a change in its corporate name to Arnesen Electrical, Inc.

Brooklyn, N. Y.—In connection with the proposed issuance of receivers' certificates for $20,000,000 by the Brooklyn Rapid Transit Co., recently authorized by Federal Judge Mayer, it is understood that a total of $5,000,000 of this issue will be used for improvements in the surface lines of the company's system.

Brooklyn, N. Y.—United States Government, Bureau of Yards & Docks, has awarded a contract to B. Diamond, 12 Bergen street, for the erection of a new extension to the substation at the local naval station.

Geneva, N. Y.—Plans have been arranged by the City Council for the immediate installation of a new electrically operated pumping unit at the municipal water works plant, to have a capacity of 4,000,000 gals. per day. The new unit will replace the two 2,000,000-gal. capacity pumps now in operation at the works. The superintendent of public works is in charge.

Lyons, N. Y.—Empire Gas & Electric Co. has filed with the Public Service Commission, Second District, a new tariff under which it proposes to establish new seasonal service power rates to all consumers within the service area having a connected 5 hp. or over and operating four months or less during the year. The company will require a guarantee of $1.00 per month per horsepower, the rates being as follows: $1.00 per month per horsepower connected, minimum 5 hp., plus 6 cents per kilowatt-hour for the first 120 kilowatt-hours' use of each horsepower connected, plus 3 cents per kilowatt-hour for all current consumed in excess of this amount. It is proposed also to arrange a seasonal charge of 50 cents per kilowatt capacity of transformer installed, to cover the cost of setting and removing transformers.

New York, N. Y.—Announcement has been made by the American Flying Club, 11 East 38th street, that plans are now in process of formation for the establishment of a chain of radio stations across the continent, in order to allow for communication of airplanes at 30-minute intervals.

New York, N. Y.—A resolution has been adopted by the Public Service Commission, Second District, calling for an investigation of the numerous complaints made by business firms as regards inefficient service recently given by the New York Telephone Co. A series of public hearings will be held commencing Aug. 8. It is understood that in connection with the inquiry, the question of rates will also be gone into.

New York, N. Y.—Effective Aug. 1, the New York Railways Co. and the Brooklyn Rapid Transit Co. have placed into operation a charge of two cents for transfers, recently authorized by Public Service Commissioner Nixon.

New York, N. Y.—Interborough Rapid Transit Co., 165 Broadway, has had plans prepared for alterations and improvements in its 1-story car repair plant at 1530-42 Lexington avenue. The work is estimated to cost about $50,000.

New York, N. Y.—New York Edison Co., 130 East 15th street, has awarded a contract for alterations in its 3-story power plant at 123 East 83rd street.

New York, N. Y.—Westinghouse Lamp Co. has recently completed negotiations for the disposal of its group of 5-story factory buildings at 510-32 West 23rd street, held at $400,000. The property is located between 10th and 11th avenues.

Niagara Falls, N. Y.—Niagara Falls Power Co. has filed application with the Public Service Commission for approval of its first and consolidated mortgage, dated July 1, to secure an issue of bonds not exceeding $75,000,000.

Atlantic City, N. J.—In connection with an ordinance recently passed by the City Commission transferring rights of the Atlantic Coast Telephone Co. to the Delaware & Atlantic Telegraph & Telephone Co., and the sale of the former company's property in Atlantic City for a consideration of about $60,000, approval has been granted by the Board of Public Utility Commissioners.

Brunswick, N. J.—Plans have been prepared by Acting Supervising Architect James A. Wetmore, Treasury Department, Washington, D. C., for the installation of new heating equipment, boiler, etc., at the local post-office building.

Hackensack, N. J.—Hackensack Water Co. has been granted permission by the Board of Public Utility Commissioners to place into effect a surcharge of 17.5% applicable to all schedules of rates existing under an order made by the Board in April, 1917.

Lambertville, N. J.—Lambertville Public Service Co. has recently completed plans for the installation of a quantity of new machinery at its local power plant, to facilitate operations. Harold R. Wilbur is manager.

Newark, N. J.—Final contracts have been awarded by the Seton Leather Co. for the construction of the proposed new tannery addition to its plant, with 1-story boiler house, estimated to cost $55,000 and $10,000, respectively. The Essex Construction Co., 87 Academy street, is the contractor.

Newark, N. J.—Krich Light Co., 70 Springfield avenue, has completed negotiations for the purchase of a 5-story brick building at 306 Market street, near Alling street, for a new establishment. The company manufactures electrical fixtures and supplies.

Newark, N. J.—Louis Sacks, operating a foundry on Wilson avenue, near Avenue L, has had plans prepared for the construction of a 1-story brick boiler plant at the works, to facilitate operations. The structure is estimated to cost $5000.

New Hope, N. J.—New Hope Electric Light Co. is understood to be con-

sidering plans for alterations and improvements and the installation of a quantity of new equipment at its power plant to facilitate operations.

Perth Amboy, N. J.—Plans are under consideration by the lighting committee of the Board of Aldermen for the installation of new electric machinery at the municipal light and power plant.

Trenton, N. J.—Board of Public Utility Commissioners has granted permission to the Eastern Telephone & Telegraph Co., operating in Camden, Gloucester and Cape May counties, to increase its rates for service.

Trenton, N. J.—Board of Public Utility Commissioners has authorized the sale of the property of the Vulcan Electric Light & Power Co. to the Cape May Court House Light & Water Co. for a consideration of about $35,072, and the issuance of stock to the amount of $24,200 by the Cape May company.

Allentown, Pa.—Lehigh Electric Co., 15-17 North Sixth street, is making alterations and improvements in its establishment, to increase the present capacity.

Catasauqua, Pa.—Lehigh Valley Light & Power Co. is planning for the immediate installation of new lighting units throughout the municipality.

Crafton, Pa.—Duquesne Light Co., Pittsburgh, has completed arrangements for the erection of a 2-story local substation on Noble street, about 24 by 83 ft., with 1-story rear wing, 42 by 40 ft., estimated to cost $45,000.

Gettysburg, Pa.—Plans are under consideration by the Town Council for the construction of a new electric light plant, to be used for municipal service.

Harrisburg, Pa.—Bell Telephone Co. has completed the removal of its offices from 208 Walnut street to larger quarters at 206 North Third street. W. H. Fetter is manager.

Harrisburg, Pa.—Bell Telephone Co. has been granted permission by the Public Service Commission to file the present rates as those to be effective after the return to private ownership by the Government of the wires, with the stipulation that a hearing should be held on Sept. 17, and notice given by advertisement for three weeks "showing in a general way the amount of such increases."

Harrisburg, Pa.—Governor Sproul of Pennsylvania has recently granted approval to the telephone merger bill passed by the Legislature. The measure provides that subject to approval by the Public Service Commission, corporation accepting the provisions of the act "may buy and own all or any part of the capital stock of any other like corporation, and may acquire, enjoy all the franchises, corporate property, rights, and credits then possessed, owned, held or exercised by said last mentioned vendor corporation" including telephone lines. The bill provides procedures for mergers.

Philadelphia, Pa.—Announcement has recently been made by the Philadelphia Storage Battery Co. of the perfection of a new storage battery guaranteed to perform substantially 100% service for a period of two years instead of 12 months. It is understood that the new battery will be placed on sale during the present month. Edward Davis is president.

Philadelphia, Pa.—Liggett & Myers Tobacco Co. has completed arrangements for the installation of new boiler equipment at its plant at Third and Ontario streets.

Philadelphia, Pa.—Plans have been completed by the A. Schoenhut Co., Adams and Sepviva streets, for the erection of a boiler plant in connection with the construction of a sawmill to be located at Venango and Amber streets. Ballinger & Perrot, 17th and Arch streets, are architects for the company.

Philadelphia, Pa.—Schimmel Electric Supply Co., 318 Market street, has acquired the building at 232-34 Market street, about 38 by 168 ft., for a new establishment. The property was held at $135,000.

Philadelphia, Pa.—The Bureau of Water is making rapid progress on improvements in the engine and pumping equipment at the Torresdale station, to increase the capacity to about 180,000,000 gals. daily. It is understood that plans are being arranged by the department for the installation of four new pumping units for the Queen Lane station, to increase the capacity from 40,000,000 gals. to from 120,000,000 to 140,000,000 per day. Consideration is also being given to the construction of additions to the filtration plant at this latter station.

DATES AHEAD.

Michigan Section, N. E. L. A. Annual convention, Ottawa Beach, Mich., Aug. 26-28. Headquarters, Hotel Ottawa. Secretary - treasurer, Herbert Silvester, Monroe, Mich.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., Sept. 3-6. Secretary, H. M. Stine, 211 Locust street, Harrisburg.

Washington State Association of Electrical Contractors and Dealers. Annual convention, Seattle, Sept. 11. Secretary, Forrest E. Smith, 205 Boston Block, Seattle.

Southeastern Section, N. E. L. A. Annual convention, Asheville, N. C., Sept. 17-19. Secretary-treasurer, T. W. Peters, Columbus, Ga.

New England Section, N. E. L. A. Annual convention, New London, Conn., Sept. 22-24. Headquarters, Hotel Griswold. Secretary, Miss O. A. Bursiel, Boston, Mass.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., Sept. 22-26. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

American Electrochemical Society Fall meeting, Chicago, Sept. 23-26 Headquarters, Congress Hotel. Secretary, Prof. Joseph W. Richards, Lehigh University, Bethlehem, Pa.

International Association of Municipal Electricians. Annual convention, Chicago, Sept. 23-26. Secretary, Clarence R. George, Houston, Tex.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., Oct. 20-23. General secretary, Clarence L. Law, 29 West 39th street, New York City.

Pittsburgh, Pa.—City Council has recently authorized the disposal of the municipal pumping station located in River avenue, in the Northside district, for a consideration of about $125,000.

Reading, Pa.—Philadelphia & Reading Railway has awarded a contract to the Robert E. Lamb Co., 845 North 19th street, Philadelphia, for the construction of a 1-story brick, steel and concrete power plant, about 30 by 50 ft.

Clarksburg, W. Va.—Weston Electric Light, Power & Water Co. is considering plans for the installation of a quantity of new equipment at its plant, including electric motors, to be used for air compressor or blower, for low water centrifugal pumps, etc., new head indicating gauges, and other equipment.

Kenova, W. Va.—Ohio Valley Electric Railway Co. will expend $50,000 in improving plant at Kenova and $75,000 in improvements in Russel, Ky. Address general manager.

Logan, W. Va.—Guyan Machine Shops desire prices on 100-hp., three-phase, 60-cycle, 800 r.p.m., 2300-volt motor with flexible coupling or pulley, and 15-hp. and 20-hp. three-phase, 60-cycle hoist motors.

Piedmont, W. Va.—Plans are under consideration by the Baltimore & Ohio railroad for the complete electrification of its system over the 17-mile grade district, to facilitate operations.

Federalsburg, Md.—Eastern Shore Gas & Electric Co. is making rapid progress on the rebuilding of its line between Federalsburg and East New Market, changing it from a single-phase to a three-phase system, to provide for increased capacity. It is understood that the company is arranging plans for the erection of a new outdoor substation on property recently acquired.

Security, Md.—Breakage, caused by a stroke of lightning on July 28, caused the suspension of operations at the large local power plant, placing out of service the entire Hagerstown & Frederick railway system which supplies power and light throughout western Maryland, northern West Virginia, and the southern part of Franklin county, Pa. An auxiliary local plant was placed into service, and work on repairs is progressing rapidly.

Dover, Del.—Central Power Co., of Chicago, a Delaware incorporation, has filed notice with the Secretary of State of an increase in its capitalization from $1,750,000, to $3,000,000.

Dover, Del.—Keokuk Water Power Lighting Co. Capital, $400,000. To operate electric light and power utilities at Keokuk, Ia. Local incorporators: L. A. Irwin, M. L. Rogers and W. H. Singer.

Wilmington, Del.—Announcement has been made by the Electric Specialty Co., 849 Tatnall street, that a new branch establishment will be inaugurated at 827 Market street.

Bakersville, N. C.—Bakersville Milling, Light & Power Co. is considering plans for the erection of an electric

plant, estimated to cost $10,000. R. T. Teague is manager.

Charlotte, N. C.—Southern Power Co. is understood to be considering plans for the construction of a new electric substation at Marshville to furnish electric power to the city, which has recently voted the issuance of bonds for $300,000, for the construction of a municipal electric system.

Hayesville, N. C.—Public Service Co. has incorporated with a capital of $125,000; incorporators are G. H. Haigler, W. J. Winchester and others. Purchased and will enlarge electric plant, develop water power on Shooting Creek, and other streams, supply city with electricity, also drill well for water supply, erect flour mill, ice and cold-storage, creamery, etc.

Gaffney, S. C.—Plans are under consideration by the Board of Public Works for the installation of a street-lighting system of the "white way" type.

Elberton, Ga.—An election will be held Aug. 27 to vote on $15,000 bonds for the extension of the light, water and sewer systems. Address the mayor.

NORTH CENTRAL STATES.

Columbus, O.—Increases in the demand for electric current from the municipal light plant will necessitate improvements and additional equipment which will cost $39,497 and to take care of these demands Superintendent Lewis Rowe has recommended to Service Director Geo. A. Borden that council authorize a bond issue of $40,000.

New Concord, O.—Bonds to the amount of $35,000 have been voted to purchase a water works and electric light plant.

Chicago, Ill.—Byllesby Engineering & Management Co. has been incorporated under Delaware laws with a capital of $10,000,000 as an affiliated organization to H. M. Byllesby & Co., Inc., Chicago.

Marquette, Mich.—Architect Thos. W. Orbison, Appleton, Wis., has prepared plans for $150,000 light and power plant to be erected by City Commission of Marquette; the building will be brick and steel, reinforced-concrete construction, including steam heating, plumbing, brick interior finish. The specifications include electrical equipment. Contracts will be let by city clerk.

South Haven, Mich.—The City Council is planning ways and means to secure additional electric power. Address city clerk.

Atlantic, Ia.—Architects D. S. Fisher & Co., Davenport, have prepared plans and will let contracts for $26,000 power plant addition to be erected by the city. The building will be brick construction, 15 by 18 ft. in dimensions, including steam heating, plumbing, fireproof interior finish. Generators, pumps, motors, etc., will be purchased for electric lighting. Address city clerk, Atlantic.

Stout, Ia.—A meeting was held to organize a company for the purpose of building an electric line from Dike to Stout and from Stout to Fern. Address village clerk.

Storm Lake, Ia.—On Aug. 11 the citizens will vote on a proposition to issue $100,000 in bonds for the erection of a municipal electric light, heat and power plant. It is believed the proposition will be carried

Terrill, Ia.—On Aug. 18 the people of Terrill will hold a special election for the purpose of voting on the proposition of issuing $6000 in bonds for electric lights and the granting of a franchise to Charles Larson, of Spencer, to furnish power for the town.

Traer, Ia.—Municipal light bonds for $50,000 have been authorized.

Wapello, Ia.—Bids will soon be advertised for the installation of a new pumping plant in the lower end of the No. 13 drainage district. Charles Young, engineer.

Kirksville, Mo.—The local light and power plant was damaged by fire; loss $15,000.

SOUTH CENTRAL STATES.

Frankfort, Ky.—Kentucky & West Virginia Power Co., recently incorporated with a capital of $6,000,000, has acquired the system of the Kentucky River Power Co. at Hazard, aggregating in value about $1,000,000; the $1,000,000 plant of the Rug River Electric Co. at Sprigg, W. Va., and the power station of the Logan County Light & Power Co. at Logan, W. Va., valued at $500,000. It is understood that additional power properties will also be developed by the new organization. R. E. Breed, president of the American Gas & Electric Co., Philadelphia, Pa., is interested in the company.

Louisville, Ky.—Wm. C. Krauth Electrical Co., 113 West Market street, will construct brick addition and install machinery. Wm. C. Krauth, president.

Owensboro, Ky.—Kentucky Electric Lamp Co. has awarded a contract for the construction of a 3-story brick and concrete plant, about 60 by 200 ft., for the manufacture of electric lamps. The structure is estimated to cost $20,000. It is proposed to increase the present capacity of the company from 3000 to 8850 lamps daily. Ray Burlew is secretary.

Wolfpitt, Ky.—McKinney Steel Co. will expend $60,000 in building power house for which considerable electric equipment will be purchased. Address general manager.

Centerville, Tenn.—City Council is arranging plans for the construction of a new municipal electric light plant. Bonds to the amount of $15,000 have been voted to cover the cost of the proposed work.

Knoxville, Tenn.—The Knoxville Gas Co. will remodel plant, for which $12,000 will be expended. The remodeling and installation of new machinery will be started at once and the work will be completed in about six weeks.

Nashville, Tenn.—Plans are being arranged by the City Council for extensive improvements and alterations in the municipal electric light plant. The work is estimated to cost $48,000.

Birmingham, Ala.—In connection with the recent issue of notes for $6,000,000, the Sloss-Sheffield Steel Co. set aside an appropriation of $1,250,000 for the electrifying of its mines in the Birmingham coal and iron district.

DeRidder, La.—City officials planning for the issuance of bonds of $100,000 to provide for the installation of a municipal electric light system and waterworks plant.

Frederick, Okla.—City will install lamps; $40,000 bonds. Address mayor.

Bryan, Tex.—The City Commission has ordered an election here for Aug. 26 to vote on issuing $75,000 bonds, the proceeds to be used in purchasing the electric light and power plant from H. T. Lawler & Sons. If the plant is purchased it will be enlarged and otherwise improved.

Dallas, Tex.—Dallas Power & Light Co. has increased its capital stock from $1,000,000 to $2,500,000. It plans important extensions to its power transmission system.

Dallas, Tex.—It is stated by J. F. Strickland, president of the Texas Electric Railway Co. and the Dallas Railway Co., that the interests which he represents will begin the construction of an interurban electric railway out of Dallas on or before Nov. 1. In an agreement entered into between the Texas Electric Railway Co. and the City Commission it is provided that the line shall be completed within 18 months from the time the work is started and that the road must be at least 30 miles in length. Mr. Strickland said that the proposed road may be built either to Terrell, Greenville or Denton. This is the first of three interurban lines arranged for when the street-railway franchises in Dallas were granted.

Fort Worth, Tex.—The local telephone company is engaged in the installation of additional facilities for the purpose of improving the local and long-distance service that will require the expenditure of about $50,000. The improvements will include underground cable extensions, the installation of switchboards, etc.

Houston, Tex.—Houston Light & Power Co. will install a 10,000-hp. turbine-generator and extend its transmission system.

WESTERN STATES.

Grand Junction, Colo.—A movement has been started at Collbran for the installation of a hydroelectric plant to supply light and power to practically every section of the Plateau Valley.

Boise, Ida.—Idaho Power Co. plans erecting a transmission line to connect its eastern and western systems in southern Idaho, and it is proposed to build a line from Shoshone Falls to American Falls to connect at the latter place with the Utah Power & Light Co.'s system. The Idaho company has completed a 4000-hp. unit at lower Salmon Falls, south of Twin Falls, and it is now proposed to build a 6000-hp. hydroelectric plant at Thousand Springs on Snake river, to reinforce its system of power production.

Ogden, Utah.—An electric line may be built from Ogden, along 21st street, to the district west of the city. John S. Lewis is president of the company.

Bellingham, Wash.—At a meeting of the Kullshan Civic Improvement Club plans for extending the electric light line to the vicinity of Lake Padden were discussed.

Portland, Ore.—Construction of a $3,000,000 radio station to be located at the mouth of the Columbia river is being considered by the Federal Government.

Scofield, Ore.—A large mill is being built on the ground where fire recently destroyed 5,000,000 ft. of lumber, the sawmill, planing mill, power house and electric lighting plant. The Standard Lumber Co. is owner.

Santa Monica, Cal.—The arc lamp lighting throughout the Palisades section of the city is to be replaced soon by ornamental post lights in many of the streets. Specifications are at the office of the superintendent of public works.

Oakdale, Cal.—Calaveras Copper Co. has in preparation plans for a reservoir and power plant to supply electricity to the plant at its mines in Copperopolis.

MEXICO.

Monterey, Mexico.—According to announcement made by the Department of Communications and Public Works of the Mexican government, it has just entered into a contract with the Mexican Tramways Co., Ltd., for the resumption of construction of the interurban electric line that is to run between the City of Mexico and Puebla, about 130 miles. The construction of this line was started about 12 years ago but before much progress had been made the revolutionary activities caused a suspension of the work. Later the lines of the company were taken over by the Mexican government, and, if they have been turned back to their owners, it is only recently that this was done. The company is composed of Canadian and English banking interests and was headed by the late Dr. F. S. Pearson of New York, who lost his life in the sinking of the *Lusitania*. The same interests own the great hydroelectric plant at Necaxa which generates about 100,000 hp. of electricity. This power is transmitted to the City of Mexico, 96 miles, to El Oro, 54 miles, and to other points. The proposed interurban electric line to Puebla will traverse a route that passes close to the foot of Mt. Popocatepetl and Ixtaccihuatl volcanoes.

Tampico, Mexico.—The Mexican government has granted a concession to the National Norwegian Co. for the construction of an interurban electric railway between Tampico and Tuxpam, about 120 miles, with branch lines to several smaller towns in the oil-producing territory. The route of the proposed main line will closely follow the Tampico-Tuxpam intercoastal canal. The National Norwegian Co. is composed of large banking interests of Copenhagen. It was organized under the laws of Mexico only a few months ago for the purpose of operating in the oil fields of the Gulf Coast region. From the very beginning it met with marked success in developing large production of crude petroleum. It has established its principal office in Tampico.

PROPOSALS

Cable.—Bids will be received by the commissioner of gas and electricity at his office, Room 614, City Hall, Chicago, Aug. 11, for furnishing and delivering to the city of Chicago, in accordance with specifications on file in the office of the commissioner and in the following approximate quantities: No. 19 B. & S. gauge paper-insulated, lead-covered, fire-alarm cable; 79,200 ft. of 15-pair, 72,800 ft. of 30-pair, No. 16 B. & S. gauge rubber-insulated, lead-covered, fire-alarm cable; 5000 ft. two-conductor and 5000 ft. four-conductor cable. Address William G. Keith, commissioner of gas and electricity.

Copper Wire.—The Department of Purchases and Supplies, New Municipal Courts building, Detroit, Mich., will receive bids until 10:30 a. m., Aug. 14, for furnishing the Board of Fire Commissioners with 50 miles of No. 10 B. & S. gauge, triple-braid weatherproof hard-drawn copper wire.

Electric Work.—Until 7:30 p. m., Aug. 12, bids will be received by Arthur Davenport, secretary of Dorranceton Borough, Wilkes-Barre, Pa., for the erection of a town hall and installation of heating, plumbing and electric work. E. E. Joralemon, architect, 547 Franklin street, Buffalo, N. Y.

Electric Work.—Until 3:15 p. m., Aug. 16, bids will be received by the Board of Education, Sussacunna, N. J., for general construction, plumbing, and electric work for the proposed alteration and additions to Port Morris school building. Rasmussen & Wayland, architects, 1133 Broadway, New York City.

Power Transmission Lines.—The Hackensack Improvement Commission, Hackensack, N. J., will receive bids until 8 p. m., Aug. 18, for construction and equipment of disposal works, flotation basins, power house, power transmission lines, air lines, ejectors, etc. Lemuel Lozier, engineer of commission, Room 3, Bank building, Main and Mercer streets.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Motors (30,106).—A man from Finland who is in this country for a short time desires to purchase shoes, raw hide, sole leather, leather goods, concrete-mixing and other building machinery, and gasoline and electric motors. Reference.

INCORPORATIONS

Wilmington, Del.—American Conduit Manufacturing Corp. has incorporated with a capital of $540,000, to manufacture electrical conduits, etc. Incorporators: C. L. Rimlinger, P. D. Drew, and H. E. Knox, Wilmington.

Belleview, Fla.—Belleview Utilities Co. has incorporated with a capital of $25,000, to operate a local light and power plant. Incorporators: F. E. Martin, president; John L. Carney, vice-president; and Edward S. French, secretary-treasurer.

Hartford, Conn.—Perry Electric Co. has incorporated with a capital stock of $20,000. George W. Perry, Ernest C. Perry and S. J. Perry are incorporators.

Boone, Ia.—Napioer Electric Co. has incorporated with a capital stock of $10,000. S. A. Walker is president and W. A. Gillette is secretary.

Hazard, Ky.—Kentucky & West Virginia Power Co. has incorporated with a capital of $6,000,000. The incorporators are Bailey P. Wooten, H. T. Taylor and J. G. Green.

Montclair, N. J.—Filtration Engineers, Inc., has incorporated with a capital of $80,000, to manufacture engines, etc. Incorporators: F. W. Young, Verona; G. H. Caffey, Brooklyn, N. Y., and H. E. Kinner, Yonkers.

New York, N. Y.—Alpha Laboratories has incorporated with a capital of $60,000, to manufacture incandescent lamps, etc. Incorporators: J. H. Mandidge, W. A. Bell, and W. T. Davis, Ogdensburg.

New York, N. Y.—Emzee Electrical Conduit & Manufacturing Co. has incorporated with a capital of $5000, to manufacture conduits and kindred equipment. Incorporators: M. E. Meredith, T. Ganer, and P. Simon.

New York, N. Y.—Motorite Corp. has incorporated with a capital of $100,000, to manufacture motors, machinery, etc. Incorporators: C. E. Taoru, S. A. H. Dayton, and M. F. Mills, 211 West 82d street.

New York, N. Y.—Paragon Incandescent Lamp Works has incorporated with a capital of $60,000, to manufacture electric lamps, etc. Incorporators: F. Alexander, N. Favian, and L. T. Levy, 110 Morningside drive.

Asheboro, N. C.—Electric Equipment Co. has incorporated with a capital of $5000 by Leo Barker, Carl Kivett, of Asheboro, and H. T. Long, of Charlotte.

Bakersville, N. C.—Bakersville Milling, Light & Power Co. has incorporated with a capital of $25,000. J. C. McBee is one of the incorporators.

Dalmatia, Pa.—Dalmatia Light Co. has incorporated with a nominal capital of $5000 to operate a local plant. F. Brosious is the principal incorporator.

Nashville, Tenn.—Gibson Light & Power Co. has incorporated with a capital of $6000. E. H. Lessenberry is the principal incorporator.

Personal

H. D. Larrabee Becomes General Manager of Eastern Connecticut Power Company—Promotions and Other Changes

EARLE W. VINNEDGE, who recently was released from military service, has joined the staff of the Worthington Pump & Machinery Co., Cincinnati office, in the capacity of sales engineer.

H. F. CAMERON, of the Lake Charles Railway, Light & Power Co., has been appointed vice-president and general manager of the Texas Gas & Electric Co., and will have his headquarters in Houston, Tex.

L. A. WALLON recently returned to Seattle from Chicago, where he was drafted by Stone & Webster on the indexing system for the appraisal of the Chicago surface lines, and is again on his job as assistant engineer of the Puget Sound Traction Light & Power Co. at Seattle.

FRED BATES JOHNSON, Indianapolis, Ind., has been named a member of the Indiana Public Service Commission by Governor Goodrich. Mr. Johnson was formerly a newspaper man and served for a time in the army. He succeeds Charles A. Edwards of Huntington.

ORVILLE R. TOMAN is again with the Continental Gas & Electric Corp., Omaha, Nebr., as superintendent of construction of overhead lines and substations. Mr. Toman served two years with the Signal Corps and was in France with the 109th Signal Battalion, specializing in radiotelegraphy and radiotelephony.

J. F. OWENS, vice-president and general manager of the Oklahoma Gas & Electric Co., has been made president of the new War Camp Community Club, which has just been organized in Oklahoma City. The organization is for the purpose of providing entertainment, suitable welcomes and employment for returned soldiers.

A. W. HOUSTON has resigned his position as vice-president and general manager of the Texas Gas & Electric Co., to accept a similar position with the Southern Utilities Co. Mr. Houston will have his headquarters in Palatka, Fla., and will have supervision of plants of the Southern Utilities Co. in the states of Florida and Georgia.

G. E. CARLSON, formerly of the F. E. Newbery Electric Co., Chicago, has been appointed manager of the Chicago office of the Hatfield Electric Co., electrical contractors and engineers, located in the Insurance Exchange building, 175 West Jackson boulevard. Mr. Carlson has had a very broad experience in electrical work and is well known in the electrical contracting fraternity.

MATTHEW S. SLOAN, operating manager of the New York Edison Co., New York, was recently elected president of the Brooklyn Edison Co., to succeed N. F. Brady, resigned. Mr. Brady will continue as chairman of the Board of Directors and the Executive Committee. Mr. Sloan was for a period of 4 years vice-president and general manager of the New Orleans Railway & Light Co.

F. N. COOLEY has been promoted from assistant sales manager to sales manager of the Seattle office of the Western Electric Co. Mr. Cooley first became associated with the company in 1912 as lamp salesman at San Francisco. Two years later he became supply specialist at Seattle, a little later becoming assistant manager there.

WILLIAM A. BAEHR, a well-known consulting engineer of Chicago, through the purchase of the Southern Illinois Light & Power Co., Hillsboro, Ill., has been elected president of that company. Mr. Baehr takes up the duties of J. J. Frey, of St. Louis, formerly president of the company. Mr. Frey, however, is retained as vice-president and a member of the Board of Directors.

ARTHUR G. GEHRIG, structural engineer, Western Electric Co., Chicago, has been appointed associate professor in civil engineering, in charge of structural engineering at the University of Nebraska. He has been previously employed by the American Bridge Co. on erection work, including the Municipal Bridge at St. Louis, and the Balboa shops, emergency dams and Navy coaling stations at the Panama canal.

THOMAS O. MORGAN, until recently head of the service department of the New York office of the American Steam Conveyor Corp., has been promoted to the position of sales engineer. He will handle Long Island and Connecticut territory. Mr. Morgan's sound experience in service work has been a splendid training for his new responsibilities and his customers are assured of receiving authoritative advice on correct ash-disposal engineering.

CHARLES S. RUFFNER, vice-president of the Union Electric Light & Power Co., St. Louis, Mo., has been elected a vice-president of the North American Co., which owns the Union company and whose common stock ownership in the United Railways is controlled by that company. Mr. Ruffner recently relinquished a part of his duties in the management of the Union company to Louis H. Egan, who has been made a vice-president, and has removed to New York where he will reside.

HAROLD D. LARRABEE has been appointed general manager of the Eastern Connecticut Power Co., with headquarters at Norwich, Conn. He is well known in the New England public utility field. He was graduated from the Massachusetts Institute of Technology in 1902 and for the last 10 years has been general manager of the Barre & Montpelier Light & Power Co., of Vermont, one of the properties under the management of Charles H. Tenney & Co., of Boston. The Barre & Montpelier Traction Co. was also under Mr. Larrabee's management during his term of service in the Green Mountain State. At Norwich Mr. Larrabee will have general charge of a 22,000-kw. generating plant interconnected by transmission tie line with the system of the New England Power Co., and supplying the principal municipalities of southeastern Connecticut with electrical energy.

W. GORDON COPELAND has resigned from his position as acting chief inspector of the Commonwealth Edison Co., Chicago, to become associated with Wm. A. Baehr, consulting engineers, 122 South Michigan avenue, Chicago. Mr. Copeland entered the Construction Department of the Commonwealth Edison Co. in 1910 but was soon transferred to the Distribution Engineering Department, in which department he worked in various capacities until 1917. At that time he entered the Coast Artillery of the Army and served as a 1st lieutenant until the close of the war, being on active duty in France at that time. On his return to the Edison company he was made acting chief inspector in the place of Capt. Arthur P. Good, who is still in Government service. Mr. Copeland is a graduate of Cornell University and has made a host of friends in the industry in Chicago.

ARTHUR B. REYNDERS, who since March, 1912, has served as director of production for the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is now works manager of the East Springfield works. Mr. Reynders was graduated from the University of Tennessee as a civil engineer in 1895 and as an electrical engineer the following year. In June, 1899, he was first employed by the Westinghouse company as a draftsman on switchboards and switchboard apparatus. Three years later he became engineer on circuit breakers, switches and relays and in 1904 was appointed acting assistant chief draftsman. In February, 1906, Mr. Reynders was appointed general engineer on insulator work, and in November, 1909, became assistant to manager of engineering. In March, 1912, he became director of production. The East Springfield works will manufacture small power motors and automobile starting, lighting and ignition equipment. Mr. Reynders is now supervising the installation of machinery.

For the Readjustment Period—What?

XLVIII.

In all lines of trade, where prices are fairly firm, the outlook for business is pronounced good, says the annual business review issued by the Continental and Commercial National Bank. The buying power in this country is enormous, and one of the reassuring features seems to be that production and consumption are fairly well balanced in most lines of activity, which means conservatism. The accompanying extracts give in some detail the reasons of the Bank for making these statements.

C. A. TUPPER *President*
INTERNATIONAL TRADE PRESS, INC., CHICAGO

Readjustment Progress Rapid

Probably the most striking feature of the present business situation is the remarkable progress that has been made in shifting industries from a war to a peace footing. Practically no preparation had been made for this change. At the time the armistice was signed we were at the apex of our war activities industrially, as well as in a military sense. The sudden change of conditions abroad made it necessary immediately to slow down in our war production, and, necessarily, this entailed a shift to normal production.

The extent to which we have readjusted is indicated by the activities in the various branches of business in this country. Those lines which in war time were restricted as non-essential, or semi-essential, naturally have increased their output. Those which were engaged in purely war production, and were running at topnotch speed and capacity, have fallen back to their normal output or less; but this readjustment has taken place with a remarkably small amount of disturbance in the business world.

Conspicuous in the responses to inquiries regarding business conditions is the unanimity of optimism. Business men, more generally than ever before, report confidence in continued industrial activity and in expanding foreign trade. At the same time there is also reflected the thought that this is not to be accomplished without the exercise of business courage, conservation and the strict adherence to sound economic principles.

Collections are very satisfactory in all lines. The fact that there is no accumulation of raw materials or partially manufactured stocks in most lines strengthens the merchandising situation, although in many instances there are sufficient stocks to permit of fairly prompt deliveries. Business men generally are looking forward to increased activities in the early fall.

Financial News

T. N. Vail Advises "Hold Your Stock."

Theodore N. Vail, chairman of the American Telephone & Telegraph Co., in a circular to stockholders of the company advises them not to sell their holdings for the purpose of putting the money into "momentarily popular" securities. "We can confidently advise our shareholders not to part with their securities for any such reason, believing that at present prices they are the cheapest, and under existing conditions the safest, of any securities of similar character," says the circular.

This sound advice should also be followed by the stockholders of nearly all other electrical utility companies. The stocks and other securities of these companies are an excellent investment in nearly all cases.

Central Power Co. of Nebraska Issues Bonds.

Halsey, Stuart & Co. and McCoy & Co., of Chicago, are offering $1,375,000 Central Power Co. first mortgage five-year 6% gold bonds, series "A." The interest on these bonds is payable without deduction of Federal income taxes now or hereafter deductible at the source not in excess of 2%.

The Central Power Co. through its own distribution system, or by long-time contracts running well beyond the life of these bonds, supplies electricity for light and power to some 31 cities and towns in eastern Nebraska, centering around Kearney and Grand Island.

The physical condition of the properties has been pronounced excellent. The bonds are secured by a first mortgage on all the properties, rights and franchises now owned or hereafter acquired by the company, whose common stock is owned by the Middle West Utilities Co. These bonds are being sold at 94.85 and accrued interest, yielding over 7¼% on the investment.

Preferred Shareholders of Northern States Power.

The progress made towards the popular ownership of electric and gas companies during the past few years is strikingly illustrated by figures taken from the shareholders' records of Northern States Power Co., which serves Minneapolis, St. Paul and 200 other cities and towns of the Central Northwest. In 1914 H. M. Byllesby & Co., the managers of the company, began to encourage investment in the company's preferred stock in the cities and towns where the Northern States organization operates. There were then 1662 preferred shareholders. The regular quarterly dividend checks in July, 1919, were mailed to 8,915 shareholders, about three-fourths of whom reside in the Northern States company's territory. In addition to the preferred stockholders, there are 1052 common shareholders. The annual increase in the number of preferred shareholders is shown by the following comparisons:

Year.	No. preferred shareholders.
June 30, 1914	1,662
June 30, 1915	1,656
June 30, 1916	3,035
June 30, 1917	5,250
June 30, 1918	7,123
June 30, 1919	8,915

New Investment Securities Partnership.

Pape, Potter & Kauffman is the name of a new organization formed, with offices at 301 Boatmen's Bank building, St. Louis, Mo., for the purpose of dealing in investment securities. C. C. Pape has been connected with Halsey, Stuart & Co. for about 10 years; Harry Potter was one of the officers of the William R. Compton Co., of St. Louis, and was connected with that firm for a long period. A. H. Kauffman has been with the Mercantile Trust Co., of St. Louis for about 11 years, the past few of which he was the manager of its investment securities department. The fourth member of the firm is C. Sewell Thomas, an engineer of wide experience.

Adirondack Electric Earnings Show Increase.

Earnings for June and 12 months ended June 29 compare as follows:

	1919.	1918.
June gross	$ 123,891	$ 133,049
Net after taxes	53,262	30,205
Surplus after charges,	26,360	8,850
12 months gross	1,787,551	1,718,150
Net after taxes	498,464	354,144
Surplus after charges.	230,250	98,323

Gross earnings of Adirondack Electric Power Co. for the 12 months ended June 30, 1919, amounted to $1,787,551, an increase of $69,401 over last year. Net after taxes for the same period was $498,464, an increase of $144,320, or 40%. April and June monthly gross earnings show decreases, while May showed an increase of only $1362 in comparison with last year.

The falling off in gross business is explained largely by the expiration of a contract under which the company furnished power to the Municipal Lighting Co. of Albany. The Adirondack company is principally a hydroelectric company, supplemented by steam electric power generation. In time of water scarcity electric power was supplied the Municipal Lighting Co. from the steam plant at Utica at a cost greater than the price paid by the lighting company under the contract. The discontinuance of this contract is substantially reflected in the increasing net earnings.

The transmission lines running to Utica have been completed and in operation since the spring of this year, making an entire system interconnected by high tension transmission lines.

Dividends, Etc.

The board of directors of the Brooklyn Edison Co. has declared a regular quarterly dividend of $2 per share on capital stock outstanding, payable Sept. 2 to stockholders of record Aug. 21.

Montreal Light, Heat & Power Co. has declared a quarterly dividend of 1¼%, payable Aug.15 to stock of record Aug. 1. Previously quarterly declarations were at the rate of 4% yearly.

White Engineering Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Sept. 2 to stock of record Aug. 15.

A quarterly dividend of $2.50 has been declared by the Tampa Electric Co., payable Aug. 15 to stock of record Aug. 2.

American Telegraph & Cable Co. has declared a quarterly dividend of 1¼%, payable Sept. 1 to stock of record Aug. 31.

The Public Service Co. of Northern Illinois has filed an application with the Illinois Public Utilities Commission for permission to issue $634,000 of its first and refunding mortgage gold bonds and authority to sell $4,366,000 of its first refunding bonds heretofore authorized.

Henry L. Doherty & Co. announce that the monthly distribution to be made on Cities Service Co. bankers shares Sept. 1, 1919, to bankers shares of record Aug. 15, 1919, will be 49.1 cents a share. This compares with a distribution of 42.6 cents a share made Aug. 1.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid July 29.	Bid Aug. 5.
Adirondack Electric Power of Glens Falls, common	6	14	12
Adirondack Electric Power of Glens Falls, preferred	6	76	75
American Gas & Electric of New York, common	10+extra	130	130
American Gas & Electric of New York, preferred	6	41	41
American Light & Traction of New York, common	..	245	228
American Light & Traction of New York, preferred	6	97	97
American Power & Light of New York, common	4	65	62
American Power & Light of New York, preferred	6	65	73
American Public Utilities of Grand Rapids, common	..	10	10
American Public Utilities of Grand Rapids, preferred	7	32	30
American Telephone & Telegraph of New York	..	103⅛	103⅛
American Water Works & Elec. of New York, common	..	5½	5½
American Water Works & Elec. of New York, particip	7	11	11
American Water Works & Elec. of New York, first preferred	..	60	58
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	23	23
Cities Servicee of New York, common	+extra	440	443
Cities Service of New York, preferred	6	79	77½
Commonwealth Edison of Chicago	8	109½	108⅞
Comm. Power, Railway & Light of Jackson, common	..	26	26
Comm. Power, Railway & Light of Jackson, preferred	6	60	60
Federal Light & Traction of New York, common	..	10	10
Federal Light & Traction of New York, preferred	..	50	50
Illinois Northern Utilities of Dixon	6	70	70
Middle West Utilities of Chicago, common	2+extra	34	34
Middle West Utilities of Chicago, preferred	6	58	58
Northern States Power of Chicago, common	..	67½	67
Northern States Power of Chicago, preferred	ex.div.7	91	91
Pacific Gas & Electric of San Francisco, common	..	68½	67
Pacific Gas & Electric of San Francisco, preferred	6	88	88
Public Service of Northern Illinois, Chicago, common	7	89	86
Public Service of Northern Illinois, Chicago, preferred	6	94	94
Republic Railway & Light of Youngstown, common	4	15	15
Republic Railway & Light of Youngstown, preferred	6	54	52
Standard Gas & Electric of Chicago, common	..	35	35½
Standard Gas & Electric of Chicago, preferred	6	45½	45½
Tennessee Railway, Light & Power of Chattanooga, common	..	6	5½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	20	20
United Light & Railways of Grand Rapids, common	4	46	45
United Light & Railways of Grand Rapids, preferred	6	73	72
Western Power of San Francisco, common	..	22	22
Western Union Telegraph of New York	extra	87½	87
Industries.			
Electric Storage of Philadelphia, common	4	91	85
General Electric of Schenectady	8	167½	162
Westinghouse Electric & Mfg. of Pittsburgh, common	7	57	52⅜